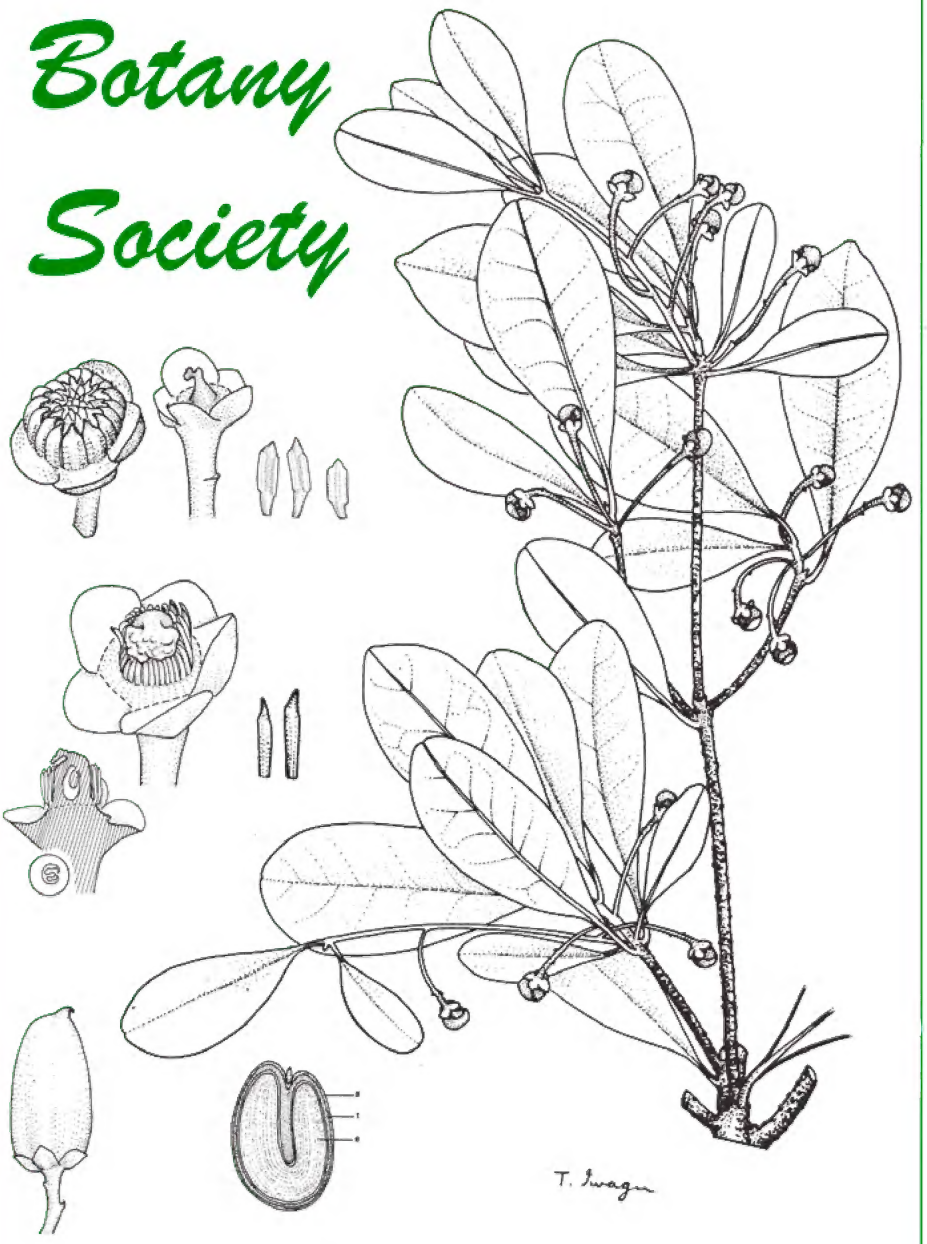
ASBS

Australasian Systematic Botany Society



Newsletter

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AUSTRALASIAN SYSTEMATIC BOTANY SOCIETY INCORPORATED

Council

President
Bill Barker
State Herbarium of South Australia
PO Box 2732
Kent Town, SA 5071
Australia
Tel: (+61)/(0) 427 427 538
Email: bill.barker@sa.gov.au

Vice President
Mike Bayly
School of Botany
University of Melbourne, Vic. 3010
Australia
Tel: (+61)/(0) 3 8344 5055
Email: mbayly@unimelb.edu.au

Secretary
Leon Perrie
Museum of New Zealand Te Papa Tongarewa
PO Box 467
Wellington 6011
New Zealand
Tel: (+64)/(0) 4 381 7261
Email: leonp@tepapa.govt.nz

Treasurer
John Clarkson
Queensland Parks and Wildlife Service
PO Box 975
Atherton Qld 4883
Australia
Tel: (+61)/(0) 7 4091 8170
Mobile: (+61)/(0) 437 732 487
Email: john.clarkson@qld.gov.au

Councillor
Daniel Murphy
Royal Botanic Gardens Victoria
Birdwood Avenue
Melbourne, Vic. 3004
Australia
Tel: (+61)/(0) 3 9252 2377
Email: daniel.murphy@rbg.vic.gov.au

Councillor
Kelly Shepherd
Western Australian Herbarium
Department of Parks and Wildlife
Locked Bag 104
Bentley Delivery Centre, WA 6983
Australia
Tel: (+61)/(0) 8 9219 9129
Email: Kelly.Shepherd@DPaW.wa.gov.au

Other Constitutional Bodies

Hansjörg Eichler Research Committee

David Glenny
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Sarah Matthews
[Vacancies to be filled by Council shortly]
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Grant application closing dates
Hansjörg Eichler Research Fund:
on March 14th and September 14th each year.
Australian Conservation Taxonomy Award:
on 22nd May 2015, 2016

Public Officer

Anna Monro
Australian National Botanic Gardens
GPO Box 1777
Canberra, ACT 2601
Tel: +61 (0)2 6250 9530
Email: anna.monro@environment.gov.au

Affiliate Society

Papua New Guinea Botanical Society

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Patrick Brownsey
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Web presence

ASBS Website: www.asbs.org.au

Webmasters
Anna Monro
Australian National Botanic Gardens
Canberra, ACT 2601 Australia
Tel: (+61)/(0) 2 6250 9530
Email: anna.monro@environment.gov.au
Murray Fagg
Australian National Botanic Gardens
Tel: (+61)/(0) 2 6250 9561
Email: murray.fagg@environment.gov.au

ASBS Facebook Group

Viewable currently to any member of Facebook; permission to post by application to administrators.

Administrators
Todd McLay, email: tmclay@unimelb.edu.au
Mike Bayly, email: mbayly@unimelb.edu.au

Cover image: *Ternstroemia monostigma* W.R.Barker (Pentaphylacaceae), a New Guinea endemic. Male and female flowers and parts (minus petals), fruit, seed in section. *Artist* Taikika Iwagu. *With permission of* the National Herbarium of Papua New Guinea.

Publication dates of previous issue
Australas. Syst. Bot. Soc. Newslett. 162-3 (March-June 2015)
ASBS Web site: 23rd Jul 2015. Printed version: 31st Jul 2015

From the President

Role for ASBS in the Flora of Australia online

ASBS has received an invitation for the President, at least in the first instance, to participate in the administration of the Flora in its new form on an Australasian web platform. (see ABRS report p. 38). The inclusion of CHAH and ABRS, key stakeholders in provision and use of flora information, in the governance model is very welcome and, while seeking further clarification, Council sees this as a welcome initiative and has accepted the invitation.

ASBS 2015 Canberra

The programme for the coming conference promises much, with reports of a lot of our members attending and a full complement of speakers filling the available slots over the three days of presentations.

Our interaction between Council and the organising committees gives a glimpse of the great amount of planning and work that goes into the meetings. Thank you Canberra.

Eichler memorial plaque ceremony

An important event organised for the late afternoon of Wednesday will be a short ceremony to unveil a plaque in the memory of Hansjorg and Marlies Eichler in recognition of their lifelong and influential commitment to plant systematics. The event will take place at the Nancy Burbidge Memorial Amphitheatre in the National Botanic Gardens, immediately after the winding up of the final conference session.

Prospective changes to our grants schemes

Using the advice of the special committee on grants policy, Council hopes to have a proposal on how best to apply the massive injection of funds from Marlies Eichler's massive bequest. (see p. 2). It is anticipated that we will be able to present a set of recommendations to members at the coming Annual General Meeting.

A major consideration for Council will be how we deal administratively with what may be, depending on the adopted grants model, a substantial increase in grants available and applications for them.

Thanks to Phil Garnock-Jones

Since Marlies Eichler's initial donation to the Society in 1997, the members of our Hansjörg Eichler Research Committee have done a fantastic job in assessing applications twice a year, which has been extended further in recent times by the addition of the Australian Conservation Taxonomy awards. The recent resignation of Phil Garnock-Jones means that we have a couple of vacancies on the Committee to fill before March next year.

New Zealand's first Nancy Burbidge Medallist, Phil willingly became his country's first representatives on the research committee, since joined by David Glenny. Thank you, Phil, for your support.

Kevin Thiele leaving PERTH

The most recent news on staff movements has been something of a shock, with Kevin Thiele's coming resignation as head of the Western Australian Herbarium. Kevin has been in that time Chair of CHAH, and has been a key player particularly in promoting our science, and in innovations in information use and delivery. We hope he is not lost to plant systematics and can continue to contribute to its future directions.

Alison McCusker

Best wishes to Alison McCusker who we understand is in ill-health. Alison is a long-time member of ASBS and formerly played a lead role in ABRS (Web ref.).

Web ref. *www.gg.gov.au/sites/default/files/files/honours/qb/qb2009/Media%20Notes%20OAM%20(M-R)%20(final)(1).pdf*

Bill Barker

Australasian Systematic Botany Society Inc.

2015 Annual General Meeting reminder

The annual general meeting of the Australasian Systematic Botany Society Inc. will be held on Monday 30th November in the Discovery Lecture Theatre on CSIRO's Black Mountain Site, Canberra, beginning at 4:45 pm (AEDT).

ASBS Inc. business

Council's new advisory committees active

Our two recently established committees have been active. The Treasurer has sought advice from that dealing with finances on our investment strategies to bring to Council on the one hand, and Council is seeking advice from the other on our strategy for providing support for research and possibly other important activities in plant systematics commensurate with the funds we have available.

Grants Policy Standing Committee

This committee was assembled earlier this year to assess ASBS policy on grants. This was seen as timely given the large growth of funds now available for grants through the estate of Marlies Eichler. The committee is charged with reviewing grants policy on an ongoing basis and providing recommendations to Council on continuance or modification of the current grants system. Committee members are Darren Crayn (ATH), Peter Wilson (NSW), Peter Weston (NSW), Alexander Schmidt-Lebuhn (CANB) and Jennifer Tate (MPN), with John Clarkson (ASBS treasurer) and Mike Bayly (ASBS Vice President/Chair). The committee has held one teleconference to date and has another scheduled for the coming weeks. Their short term aim is to make recommendations to Council ahead of the ASBS council meeting in Canberra in November. Council will consider these recommendations and raise them with members more broadly at the upcoming AGM.

Mike Bayly

Eichler Research Fund report

Molecular systematics and biogeography of *Logania* R.Br. (Loganiaceae)

Charles Foster
School of Biological Sciences, The University of Sydney

The Australian continent contains a number of biomes that have undergone great change over millions of years. The process of range contraction and expansion is perhaps best exemplified by the arid and mesic biomes. Geological changes over time caused differential rainfall patterns to develop across Australia, leading to a significant decline of the mesic biome and an increase in aridification (Hall 2002; Byrne et al. 2008; Byrne et al. 2011). Concurrent habitat fragmentation probably led to speciation in many taxa (Byrne et al. 2011). Additional historic geological events have also been proposed to have led to vicariant speciation in many taxa. For example, the flooding of the Eucla Basin in southwestern Australia has been proposed as a powerful biogeographic event that led to east-west speciation within many mesic taxa (Heatwole 1987; Mast and Givnish 2002).

In my honours project, I aimed to investigate the effect of historical biogeographic events on *Logania* R.Br., a genus of flowering plants with a noticeable east-west distribution considered endemic to Australia, with the exception of one species in New Caledonia and another (presumed extinct) species in New Zealand. Additionally, I aimed to test the monophyly of the genus, which contained two sections: *L.* sect. *Logania* and *L.* sect. *Stomandra*. Each section had clear morphological synapomorphies (Conn 1994; Conn 1995), but the results of a molecular analysis of the tribe Loganieae questioned the monophyly of *Logania* as a whole (Gibbons et al. 2012). I applied for funding from the Hansjörg Eichler Scientific Research Fund to help undertake this project, and successfully received the requested amount ($1950).

To achieve the aims of my project, I amplified the petD and rps16 chloroplast regions

for 21 and 27 accessions, respectively, of *Logania*. I combined the resulting novel sequences with those available for *Logania* and several outgroup taxa on GenBank. I analysed the sequence alignments using maximum-parsimony, maximum-likelihood and Bayesian methods. I found that the one species from New Caledonia did not belong within *Logania*; instead it was nested within *Geniostoma*. In all cases, *Logania* was recovered as polyphyletic with strong support, but each section was recovered as monophyletic. Hence, I considered each section separately for biogeographical inference.

Since I calibrated the Bayesian analyses with fossil information and used a relaxed molecular clock, I was able to infer the evolutionary timescale of the taxa. I then plotted the timing of the flooding of the Eucla Basin and the intensifying aridification of Australia following the mid-Miocene climatic optimum onto the chronogram obtained in the Bayesian analyses. Following the methodology of Crisp et al. (2011), a proposed biogeographic process was considered to provide a plausible explanation for the distribution of taxa if its timing fell within the 95% credibility interval of the date estimate for the corresponding evolutionary divergence. I rejected hypotheses if the divergence event occurred either before or after the proposed biogeographical event. I found that the east-west divergences in *L.* sect. *Logania* did not coincide with any of the inundations of the Eucla Basin, and, therefore, these events could not be considered to have caused the disjunct distribution. However, there was an overlap with each of the east-west divergences within *L.* sect. *Stomandra*, meaning that vicariant speciation following flooding of the Eucla Basin remains plausible for this group. Additionally, most of the divergences within each section coincided with intensifying aridification after the mid-Miocene climatic optimum.

My honours project resulted in three publications. The first publication reassigned *Logania imbricata* to *Geniostoma* as *Geniostoma imbricatum* (Foster and Conn 2013), the second described the overall results of the project, including the non-monophyly of *Logania* and the biogeographic findings (Foster et al. 2014b), and the third raised *L.* sect. *Stomandra* to genus level as *Orianthera* C.S.P.Foster & B.J.Conn and made all other necessary taxonomic changes (Foster et al. 2014a).

The funding from the Hansjörg Eichler Scientific Research Fund greatly aided this project by covering the costs of many reagents, as well as expenses for trips into the field or other institutions. I am very thankful for the assistance it provided.

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Articles

Adventures in plant anatomy – not just a pigment of my imagination.

Tanya Scharaschkin
School of Earth, Environmental & Biological Sciences
Queensland University of Technology. Email: *t.scharaschkin@qut.edu.au*

My initial interest in plant anatomy was aroused purely for aesthetic reasons when I first saw epidermal cells of flower petals. The sheer beauty of the colours and patterns amazed me. This article is a personal account of what I consider 'my adventures with plant anatomy', as a student and teacher and as a scientist and artist.

I studied plant anatomy in a lot of detail in my undergraduate and Masters degrees in Pakistan. At that stage I was aspiring to become a vertebrate paleontologist and was more interested in zoology than botany, but it proved to be a great foundation to build upon once I decided to become a plant systematist. The real passion for plant anatomy, as a scientific discipline and an area of expertise worth pursuing, was stirred during my PhD when I took a comprehensive course taught by Dr Deborah Canington, at the University of California, Davis, USA. Dr Canington, who had been taught and inspired by Katherine Esau, was an excellent lecturer – she delivered her lectures by writing and drawing on a blackboard (yes, chalk and board was still very much in use in 1999) and making use of 35 mm slides to show us examples towards the end of lecture. We were not provided with lecture notes and there weren't any power point slides. The practicals included a combination of observing prepared slides and making our own slides using free-hand sectioning and staining, accompanied by a lot of drawing and labeling. The activities undertaken during the practicals were not assessed, but we had regular quizzes and theory and practical exams. There is no better way to get immersed into such a subject other than having 3 hours of lectures and 6 hours of practicals each week for 12 weeks. I wish I could teach a similar course, but it seems the days of intensive, specialized subjects are a thing of the past.

When I first started teaching at QUT in 2006, not much plant anatomy or morphology was being taught in the basic biology degree and technical expertise in the area of plant anatomy at QUT had greatly diminished with the retirement of technicians and researchers. The inevitable consequence was a reduction in the capability of undertaking any plant anatomical research, even if it involved utilising some of the more basic methods. Fortunately histopathology (animal) is a major area of research and teaching in the Faculty of Health at QUT. The technical expertise and training provided by the histology staff (especially Helen O'Connor and Felicity Lawrence) has enabled me to pursue my goals of trying to reinvigorate an interest in plant anatomy through teaching and research.

Over the past 10 years I have gradually increased the theoretical and practical component of plant anatomy in undergraduate subjects. The exciting, but challenging, part has been developing suitable practicals. Most of the techniques are simple ones but even these have required some adjustments, such as using single-sided blades instead of the more suitable double-sided ones for safety reasons. Students now get to learn some standard techniques such as making epidermal peels and replicas and free-hand sectioning and staining. We have purchased new prepared teaching slides in sets of 20 and continue to add to this collection by making new slides relevant to understanding the anatomy of Australian plants. In 2014, I ran a 3-day Continuing Professional Education (CPE) course in plant anatomy. Participants included postgraduate students, technicians and researchers from different universities, research institutes and the Queensland Herbarium Brisbane, and one participant all the way from Townsville. The participants provided overwhelmingly positive feedback and suggested a follow-up course

in more advanced histological techniques (paraffin embedding, microtomy, SEM). An unexpectedly successful activity, that also proved somewhat challenging, involved the use of play dough to make 3D models of cells and tissues (Fig. 1, 4E). I have subsequently used play dough in undergraduate classes to help students differentiate between different orientations of sections (such as radial longitudinal versus tangential longitudinal).

I use a variety of histological techniques, depending on the nature of the research question and quality of images required for publication. Some techniques, such as epidermal peels and replicas, are inexpensive and allow for quick preparation of a large number of samples and are suited for the collection of some types of data (e.g., stomatal counts), but don't necessarily produce high quality images. Similarly, freehand sectioning

Fig. 1. Top, the 2014 CPE Plant Anatomy for Scientists course showing one's never too old to make use of play dough: from left, Tanya, Joshua Buru, John Thompson, Mario Brock. Bottom, teaching plant anatomy: students from the 2014 CPE Plant Anatomy for Non-Scientists and Artists class using microscopes.

provides a rapid method that can produce publishable results although the thickness of the sections cannot be controlled (hand-held microtomes can overcome this issue). If these simple techniques fail to provide the level of detail that I require, then I move on to more time-intensive techniques such as SEM and paraffin embedding and the use of a rotary microtome.

There are numerous areas of research where an understanding of plant anatomy plays a significant role. Disciplines, such as plant taxonomy, rely heavily on anatomical and morphological observations to identify and classify plants. Other (somewhat random) examples include understanding the evolutionary history of plant groups (placement and affiliation of fossil taxa in extant lineages, adaptation of plants to different environments), reconstructing past climatic conditions (historical as well as on a more recent timescale), adaptation, defense mechanisms and structural changes in response to stress (drought, heat, pathogens, herbivores), improved agricultural outcomes (e.g., interaction between plant roots and fungal association, uptake of minerals, biofortification) environmental cleanup (uptake and distribution of heavy-metals), development of new materials (self-cleaning, adhesive, etc.). I am involved in a number of projects that include anatomical research, such as:

- Weed biology: Leaf anatomy, eco-physiology and plasticity with implications for biological control of invasive weeds, such as cat's claw creeper (*Dolichandra unguis-cati*), Madeira vine (*Anredera cordifolia*), bellyache bush (*Jatropha gossypifolia*). Collaborators include Richard Boyne, Joshua Buru and Cristina Latorre. [1-3] (Fig. 2).
- Evolutionary history: Phylogenetic relationships, based on morpho-anatomical and molecular data, of the plant family Myrtaceae, with a particular focus on the Chilean species and a tribal level study of leaf and flower anatomy, in collaboration with Hernan Retamales [4, 5] (Fig. 3).
- Australian biodiversity and systematics: Evolutionary relationships and structure of grasses (subtribes Tripogoninae and Rottboelliinae), in collaboration with Melody Fabillo [6] (Fig. 4).

Fig. 2. Investigation of extrafloral nectaries in cat's claw creeper (*Dolichandra unguis-cati*) using different techniques. (A) epidermal replica, (B) leaf clearing, (C) epidermal peel, (D, E) transverse sections, (F) paradermal section. (D, E & F: paraffin-embedded leaf blade cut at 10um thickness)

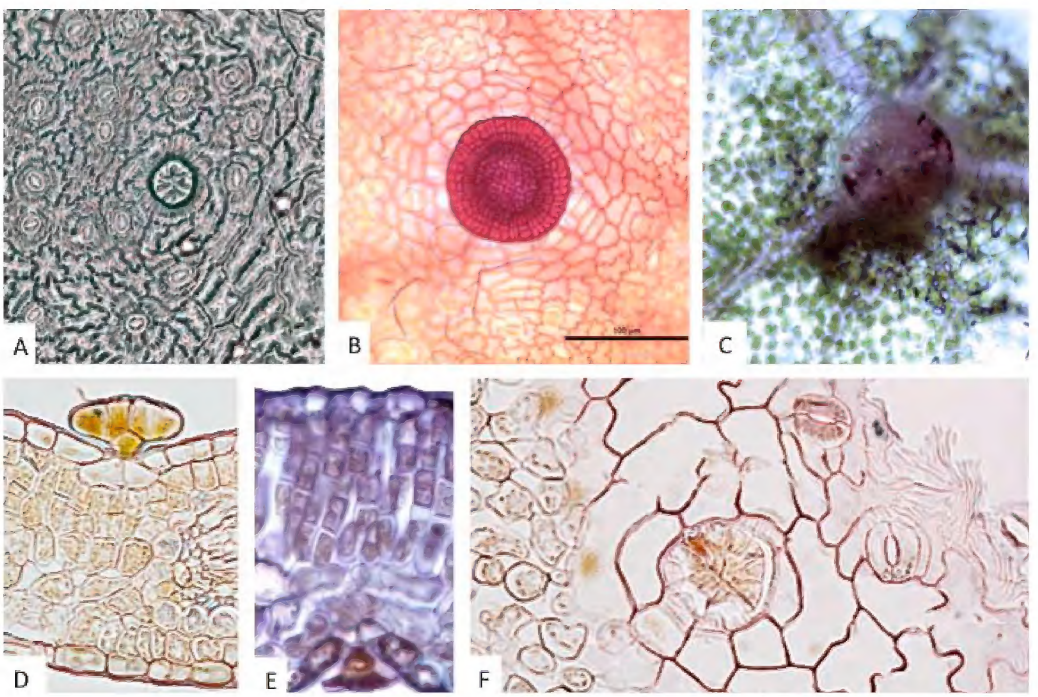

Fig. 3. Comparative midrib histology of Myrtaceae (paraffin-embedded leaf blade cut at 8µm thickness, stained with Ruthenium Red and TBO)

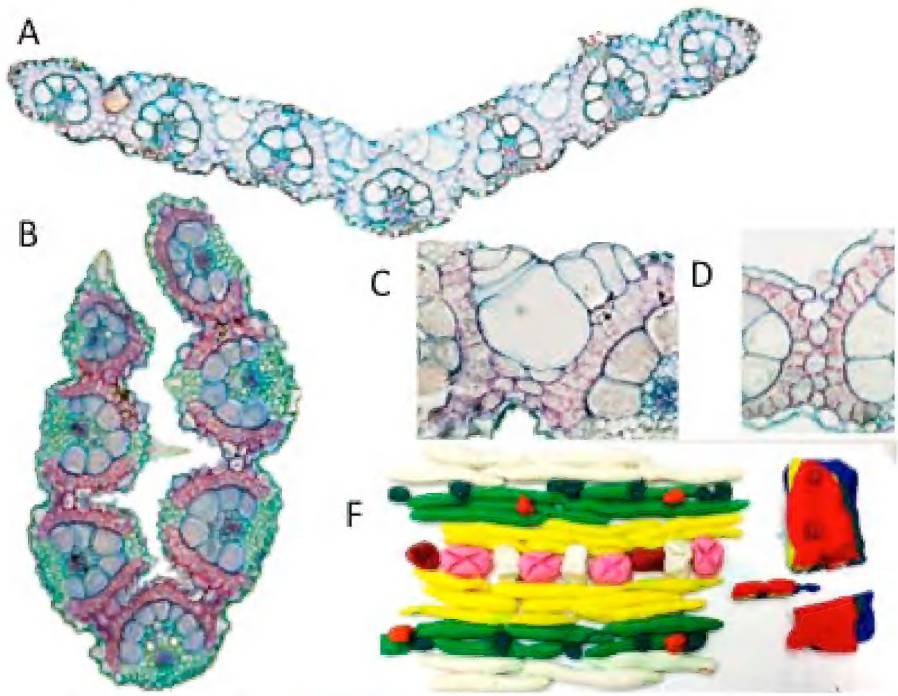

Fig. 4. Comparison of hydrated and desiccation tolerant leaves of *Tripogon loliiformis*, a native resurrection plant. A-D, Resin embedded specimens, cut at 6 um and stained with TBO and Ruthenium red: A, flat hydrated leaf; B, folded desiccation tolerant leaf; C, fully expanded bulliform cells in a hydrated leaf; D, collapsed bulliform cells in a desiccation tolerant leaf. E, Tanya and Melody, developing an understanding of the orientation and arrangement of cells on the surface of *T. loliiformis* leaves. F, The resulting leaf micromorphology play dough model,

An aspect of my involvement with plant anatomy that might actually qualify as an adventure has been to find ways in which to extend it to art and cross-disciplinary teaching. In 2014, I ran a 1-day CPE course "Plant anatomy for non-scientists and artists". This turned out to be much more popular than I had thought it would, and it has been interesting seeing some of the resulting artwork. I have collaborated with Dr Manuela Taboada (School of Design, QUT) and run a plant anatomy practical for students enrolled in the subject 'Typography and Illustration'. The students have gone on to develop a typescript based on their observations of permanent slides or ones they prepared themselves. As with the CPE course, it was the first time many of these students had worked in a science laboratory. They found the experience a novelty and enjoyed the hands-on activities of sectioning and staining, making their own slides and using a microscope. And, as I hoped, they were amazed by the purely aesthetic nature of what they saw under a microscope and got interested in learning a bit about plants in the process. An example of the result of such inspiration is seen in Fig. 5. More recently, another cohort of students, under the guidance of Associate Professor Kathi Holt-Damant (Institute for Future Environments, QUT) have been developing designs for meeting rooms inspired by plant structure (Fig. 6).

As many ASBS members know, I recently had a go at entering plant anatomy images for the QUT Nikon Small World microscopy competition Two out of three of my entries made it to the final list and thanks to all the ASBS votes (courtesy of Nathalie Nagalingum, who posted a message on ASBS facebook), one of the images won the People's Choice Award by a wide margin. Interestingly both images involved very simple techniques (epidermal scales dusted off *Tillandsia* and free-hand sectioned *Orthrosanthus* leaf). This "success" has inspired me to produce a series of cards and mugs promoting plant anatomy (see advertisments on pp. 10–11).

Finding a way to combine art and plant anatomy has been particularly gratifying, especially given that my own interest in this subject arose due to the visual appeal of plant cells. I look forward to continuing with research and teaching involving plant anatomy. If any readers have ideas for promoting an interest in plant anatomy or collaborating on projects, please do not hesitate to contact me.

Acknowledgements

I would like to thank members of the Plant Structure and Systematics Group (J. Beattie, M. Brock, J. Buru, M. Fabillo, C. Latorre and H. Retamales) for some of the images included in this article.

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Fig. 5. Artwork by Jocelyn Thompson, inspired by a course in plant anatomy.

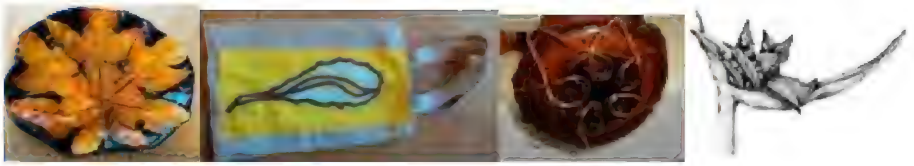
Fig, 6. Conceptual models for a meeting room, inspired by the leaf folding response of *T. loliiformis* to desiccation. (images and design by QUT student, Ashley Brown).

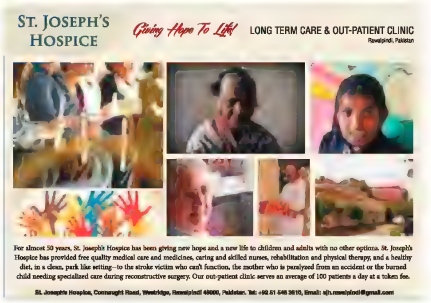
Advertisements.
Christmas presents, anyone? Below and across, Tanya's "Exclusive" plant anatomy merchandise consisting of cards and mugs, being sold for charity.

Fundraising Appeal
Botanical Art & Craft Sale
Tanya Scharaschkin

Tanya is raising funds for two organisations in Pakistan. Profits from the sale of her art and craft work will be donated to these institutions.

Please email Tanya for more information on the items listed below: Original art work, Botanical craft jewellery, Clay leaf imprints (bowls, pendants, ornaments), Hand-appliqued bags (Australian foliage) and check out ASBS Facebook page for pictures of cards and mugs.





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Tanya Scharaschkin
(+61) (0)7 3138 1395 ***t.scharaschkin@qut.edu.au***

Role of chromosomes in systematics, evolution and phylogenies

Prashant Joshi
Research/Teaching Technician, Institute of Fundamental Sciences (Plant Science), Massey University, Palmerston North, New Zealand

The 2014 Australasian Systematic Botany Society's conference at Massey University, Palmerston North, New Zealand was a great success in terms of the standard of the papers and posters presented. Many talks and posters centred around the use of ITS/chloroplast sequence data and Next Generation Sequencing techniques to construct plant evolutionary trees (phylogenies), which was the theme of the conference. In general the use of chromosome data was limited to reporting their number and ploidy level (derived from previous counts) in most of the papers presented; there was only one talk in which molecular cytogenetic data was presented in support of the DNA data. With this small article I wish to highlight the importance of cytogenetics and molecular cytogenetic tools (data) in phylogenetic studies. This not only will strengthen the phylogenetic tree, but, would also help clearly identify the progenitors of the present day species and the path by which they came to existence.

Chromosomes (coloured bodies) are specialised entities, which harbour DNA packaged in an ultra-coiled structure (nucleosome) that carries the genetic information from one generation to the next in sexually reproducing organisms. In the way each organism has unique morphological and molecular features, its chromosome signatures are also unique. Chromosome number, type and symmetry (karyotype) vary from species to species (also in some cases vary within species) and fine details can be visualised by specialised staining techniques. Techniques like fluorescent in situ hybridization (FISH) and genomic in situ hybridization (GISH) pick up differences among individual chromosomes of a species, which are hard to visualise with conventional staining (carmine, feulgen or banding). Furthermore, FISH and GISH also identify different genomes merged in a species (hybrids and allopolyploids) and thus shed light on the evolution of the species. Hence, chromosomes form a characteristic feature of a species and an important dataset in plant systematics.

Lewitsky (1931) and Stebbins (1971) highlighted the usefulness of the many morphological characters that make up a karyotype for inferring evolution. The demonstrable ways in which karyotypes may differ from one another is constantly increasing with the development of new techniques (Jackson 1971). Jackson (1971) suggested 12 phenotypic characteristics of a karyotype which can be used in phylogenetic analysis namely:

- chromosome number,
- kind of centric activity,
- size of localized centromeres and the number of microtubule attachments sites,
- arm ratios,
- number, size and position of secondary constriction and satellites,
- absolute size of the chromosomes,
- size difference within a complement,
- position, number, size, and distribution of differentially staining heterochromatic segments,
- 3H-thymidine labelling sequence,
- position of annealing sites that are specific for different classes of nucleic acids,
- number of DNA strands per chromosome,
- total amount of DNA.

Many researchers have used these characters individually or in combination to explain the process of chromosome evolution and in turn the evolution of a species. More recently Levin (2002) reemphasised their usefulness, along with modern molecular cytogenetic tools in plant evolution and systematics.

Starting with the karyotype, I wish to discuss some of these characters and how they are still useful in the modern world of molecular evolutionary biology and systematics. A detailed review of the karyotype in systematics was published by Lewitsky (1931). He emphasized that the "karyotype" has some bearing on taxonomic rank, be it the family,

tribe, genus, species or race. 19th century plant cytologists and evolutionary biologists used this chromosome data and tried to infer the evolution of chromosome number and type in different plant species, e.g. Perry (1943) in Euphorbiaceae, Raven & Kyhos (1965) in woody Ranales, and Hanelt & Mettin (1966) in genus *Vicia*. In fact Raven & Kyhos (1965) by studying the chromosomes in woody Ranales predicted that the basic chromosome number in angiosperms is n=7. Though chromosome number and morphology studies form a good data set in plant evolutionary study, Stebbins (1971) warned taxonomists to be cautious to use chromosomal data in evolutionary studies when karyotypes (number, morphology and symmetry) of non-related genera resemble each other and when there is large karyotypic variation within a single genus or even members of the same species. But, with modern molecular cytogenetic tools it is now possible to identify individual chromosomes of a species with almost identical chromosome morphology in the same species or in different species or genera or in an allopolyploid (Schubert et al. 2001).

Extensive studies on *Vicia* (Fabaceae) suggested that it harbours large scale chromosomal alterations (Yamamoto 1973, Raina & Rees 1983, Raina et al. 1989, Raina 1990, Maxted et al. 1991). To further test this notion Bisht et al. (1998) studied structural/ morphological variation in the nucleolar chromosome (NOR bearing chromosome) in 67 *Vicia* species/subspecies. By studying various morphological characters of these nucleolar chromosomes, Bisht et al. (1998) postulated that these variations originated from chromosomal inversion, deletion and interchange events. After undertaking a cluster analysis of the nucleolar chromosome arm ratio in 53 *Vicia* species, a possible relationship among them was established by Bisht et al. (1998).

With the onset of DNA sequencing technology there was a flood of papers describing systematics and evolution of different species and genera based on the nuclear and chloroplast DNA sequence data. The new generation of molecular biologists largely ignored chromosome data except the mention of diploid chromosome number or occasionally the ploidal level. No doubt this has generated enormous amounts of phylogenies/evolutionary trees of various taxa within a very short time span, but it somewhat falls short of explaining the precise mode of evolution of present day species. The visual proofs of the predictions made by the conventional cytologists and breeders mentioned earlier started resurfacing only after combining the molecular data (DNA sequence data) with molecular cytogenetic studies.

Fluorescence in situ hybridization (FISH) and genomic in situ hybridization (GISH) are the two techniques that provided the visual proofs. The most widely used FISH markers are constitutive heterochromatin and rRNA genes (Sonja 2014). The constitutive heterochromatin is either GC or AT-rich or "neutral" (Sonja 2014). Fluorochrome chromomycin A3 binds to GC-rich regions in DNA. DAPI (4',6-diamidino-2-phenylindole) or Hoechst (bisbenzimide 33258) binds to AT- rich regions of DNA. Banding patterns produced by these fluorochromes on the metaphase plate of a species not only help identify the homologous chromosomes, but, also help to infer the phylogenetic relationships among species (Hizume et al. 1990, Muratovic et al. 2010). The second markers used in FISH study are 45S and 5S rDNA genes. The 45S rDNA genes or the nucleolar organizing region (NOR – the faintly coloured region in conventional staining) are present in high copy number and are conserved and they identify the NOR chromosomes. The 5S rDNA genes are also present in multiple copies and are conserved.

Genomic in situ hybridization (GISH) highlights the entire genome of a species in a hybrid or a allopolyploid and was first demonstrated by Schwarzacher et al. in 1989. GISH is often used to verify the allopolyploid origin of species, to confirm presumed interspecific hybrids and chromosomal additions including rearrangements with parts

of the host genome or to detect even relatively small introgression of alien chromatin (Schubert et al. 2001, Chester et al. 2010).

Ownbey (1950) confirmed the recent origin of the two allopolyploids *Tragopogon mirus* and *T. miscellus* from the three diploid species *T. dubius, T. pratensis* and *T. porrifolius* in North Western United States and conventional cytological preparations showed additivity of the genomes. Recent papers published on evolution of *T. mirus* and *T. miscellus* elaborate the utility of both FISH and GISH in resolving the complexities in these recently formed allopolyploid genomes. The molecular cytogenetic study made it easier to assess how much genome of each of the two polyploids is contributed by its respective parental genome. FISH-GISH studies in combination also helped to identify intergenomic translocations and compensating aneuploids in *T. mirus* and *T. miscellus* natural populations (Chester et al. 2012, Chester et al. 2013, Lim et al. 2008). Going further from *T. mirus* and *T. miscellus* Lipmon et al. (2013) also showed (using FISH-GISH) that these two newly formed allopolyploids have undergone hybridization and the resulting hybrids have their own unique karyotype.

Molecular cytogenetic tools have been used in many plant genera to resolve the phylogenetic relationships, to discern the origin of species, to localize single copy or repetitive DNA sequences on chromosomes and to construct physical maps. For example, using ten different repetitive DNA sequences in a FISH study, Lim et al. (2000) proposed a phylogeny depicting the origin of present day *Nicotiana*. Mandakova and Lysak (2008) argue that due to low levels of homoplasy arising from chromosomal rearrangements, they are more successful in resolving the conflicting phylogenetic relationships. Making use of Comparative Chromosome Painting (CCP), Mandakova & Lysak (2008) were able to resolve the phylogeny within the Brassicaceae and were also able to predict the mode of evolution of n=7 from n=8 with reconstruction of the ancient karyotype. Mahelka and Kopechy (2010) were able to trace the allopolyploid origin of *Elymus repens* (Poaceae) using ITS and GBSSI DNA sequence data in combination with FISH and GISH studies. The extensive study concludes that *Elymus repens* has *Pseudoroegneria* and *Hordeum* as its main genome contributors along with one unknown genus and *Panicum*, *Bromus* and *Taeniatherum* introgressed before or after chromosome doubling. Williams et al. (2012) using FISH-GISH on *Trifolium repens*, *T. pallescens* and *T. occidentale* confirmed that the latter two are the parental species contributing genomes to allotetraploid *T. repens*.

There are many more such examples of using molecular cytogenetics to resolve or support phylogenetic studies. Chester et al. (2010) have already outlined the use of modern cytogenetic tools in studying hybridization and polyploidy in nature and thereby tracing the origin of the species and phylogenetic relationships. It can further be put to use in hybridization programmes in crop plants and conservation studies. The enormous amount of DNA data generated by next generation sequencing can be used to search for dispersed or repetitive DNA sequences, which can further be used in the FISH studies (Chester et al. 2010). Pires & Hertweck (2008) coined the term *phylogenomics,* which combines cytogenetics and genomics with phylogenetics. It is assumed this will be able to decipher relationships not only among organisms but also between all the genes within an organism.

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Further thoughts

Fossil names: homonyms affecting the names of Australian species of *Acacia*, *Grevillea* and *Hakea*

Karen Wilson
National Herbarium of NSW, Royal Botanic Gardens and Domain Trust, Sydney

Stephen McLoughlin outlined in the last issue of the *ASBS Newsletter* (no. 162–3, pp. 8–11) the problem of finding out whether there are fossil plant names at generic level that are earlier than extant or proposed plant generic names. As he said, we lack a single source for fossil names. It is a shame that there are no generous benefactors like Charles Darwin in the past who might provide for such a facility (Darwin gave a bequest to start *Index kewensis*).

A new site, mentioned in the editorial footnote of the McLoughlin article, *The International Fossil Plant Names Index*, aims to fill that gap.

> The goal of *The International Fossil Plant Names Index* (*IFPNI*) *Project* is to compile and maintain a comprehensive literature based record of the scientific names of all fossil plants, algae, fungi, allied prokaryotic forms, protists (ambiregnal organisms) and microproblematica.

This will be very useful in the future but it is still in a very early stage with low coverage of names.

And, of course, the problem is with fossil names at all ranks below genus, too. Ian Turner (2014) searched the fossil literature for names at specific rank, using Biodiversity Heritage Library and other online resources such as Google Books, Gallica and HathiTrust Digital Library.

He found about 100 cases of fossil names that pre-date names of angiosperm species. Happily, many have no real nomenclatural effect because the angiosperm names are synonyms (including one *Acacia* and one *Eucalyptus* name).

However, Turner has published new names for 34 species, including the following Australian taxa:

- *Acacia* (4 new names)
- *Grevillea* (3 new names plus a new subspecific combination)
- *Hakea* (2 new names)

There is also an authority change for *Chamaecrista concinna* to just 'Pedley' because the basionym, *Cassia concinna*, turns out to be a later homonym of a fossil name.

Two of Turner's new names (both for non-Australian taxa) turned out to be later homonyms themselves so they needed two new names (Turner 2015).

He finished his 2014 paper with comments about the extent of the problem for angiosperm names:

> … it seems a relatively greater threat for woody plants and very low probability for monocots. Large genera, particularly those which include temperate trees, relate to basic leaf size or shape seem prone to risk. To help reduce the likelihood of creating new homonyms, particularly when naming species in those susceptible groups, it may be worth checking for potential competing fossil names.

That seems good advice for anyone dealing with names for new genera or species in a woody group of angiosperms, particularly if it is a big group, in the absence of a comprehensive list of paleotaxa.

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Web ref. *http://fossilplants.info/*

Since the paper is not freely available on the web the changes affecting the names of native Australian flora have been listed here. There do not appear to be any changes in the names of native New Zealand taxa. The changes have now been incorporated in APNI.

- *Acacia exilis* Maslin has been replaced by *Acacia exigua* I.M.Turner
- *Acacia gracillima* Tindale replaced by *Acacia minniritchi* I.M.Turner
- *Acacia brachycarpa* Pedley replaced by *Acacia neobrachycarpa* I.M.Turner
- *Acacia rigida* Maslin replaced by *Acacia neorigida* I.M.Turner
- *Grevillea coriacea* McGill. replaced by *Grevillea mcgillivrayi* I.M.Turner
- *Grevillea dissecta* (McGill.)Olde & Marriott replaced by *Grevillea neodissecta* I.M.Turner
- *Grevillea rigida* Olde & Marriott replaced by *Grevillea neorigida* I.M.Turner
- *Grevillea rigida* ssp. *distans* Olde & Marriott replaced by *Grevillea neorigida* ssp. *distans* (Olde & Marriott) I.M.Turner
- *Hakea plurinervia* F.Muell. ex Benth. replaced by *Hakea benthamii* I.M.Turner
- *Hakea spathulata* (Benth.) R.M.Barker replaced by *Hakea neospathulata* I.M.Turner

Eds.

The life of Ernest Bickford – an addendum

Greg Keighery
Western Australian Herbarium

With the assistance of chemist and genealogist Cyril Kelly who was able to check the Western Australian State Records Office for Births, Marriages and Deaths (Web ref.) I have been able to add further to the account of the life of Ernest Bickford (Keighery 2015).

The search revealed that Ernest Bickford and his wife Mary had six children (Ernest, John, Leslie, Margaret, Percy and Richard) between 1896 and 1903 and a stillborn baby in 1904. None of of these children married or died in Western Australia.

Further checking by Cyril of the New South Wales listings of Births, Deaths and Marriages showed that Ernest and Mary had three more children (Arthur, Mary and Ethel) in New South Wales from 1907 to 1913.

He also located a notice of Ernest's death in 1940. The *Sydney Morning Herald* of Saturday 20 April 1940 in the death notices noted that "Ernest J. Bickford died April 19, 1940 at a private hospital, husband of the late Mary Bickford (d. 1928) of West Ryde, aged 78 years".

We can add that Bickford was born in 1862 in Victoria and died in 1940 in New South Wales. Bickford apparently left Western Australia for New South Wales probably in 1906 or 1907 and apparently ceased any further involvement with botany.

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Point of view

How long does it take for an alien species to get citizenship?

Tony Orchard
c/o Australian Biological Resources Study
GPO Box 787, Canberra, ACT 2601

In the last *ASBS Newsletter* Greg Keighery (2015) commented on my characterisation of various *Bidens* species as either native or naturalised. I think that this article deserves a reply.

Let me start by refuting one point: Greg states that I produced a "revision" of *Bidens*. Nothing could be further from the truth. In 2012 I was asked whether I would produce a *Flora of Australia* treatment of the Heliantheae alliance and Eupatorieae (well over 100 species). I also needed to compile the introductory chapters, key to genera and linking descriptions throughout. Some treatments were already in-house, but needed heavy revision; others needed to be developed from scratch. The time line was very tight – I was aware that ABRS was considering bringing the hard-copy publication of the *Flora* to an end, moving to electronic publication only. I agreed to undertake the compilation on condition that the result would be published in book form. This was agreed, and *Flora of Australia* vol. 37 was the result. The time available to write the needed texts and to integrate them with others was thus less than 18 months, from a standing start (I had no previous experience with this group within Asteraceae). The result was necessarily a compilation of a consensus account of most taxa, including *Bidens*, not a revision, although for a few groups (e.g. *Eclipta*, *Blainvillea*, *Pentalepis*, the *Wedelia* complex) I did find time to produce revisionary papers. For *Bidens* I had just a few weeks to try to make sense of divergent State and Territory accounts, but certainly no time to investigate true taxonomic status or nomenclature.

Bidens is a superb weed. It has a very short generation time, with juvenile plants only a few centimetres high capable of flowering and fruiting within weeks of germination, it produces large quantities of seed (certainly hundreds, perhaps thousands on a large well-grown plant), the flowers appear to have a high degree of self-compatability as all heads usually produce a full complement of seed, the seeds are relatively light for their size, and have two or more stout flesh-piercing awns, each tipped with a grapnel of retrorse barbs well adapted to cling to fur, feathers or clothing (Fig. 1). The awns and body of the fruit may also bear short stiff retrorse or antrorse hairs. *Bidens* taxa are therefore readily adapted for long and short distance dispersal, and for colonising new (particularly disturbed) habitats.

It is now generally thought that the family Asteraceae originated and initially diversified in Andean South America. From there it spread to the rest of the world, evolving new genera and species (the tribes were probably already derived in South America). Thus, for Australia, all Asteraceae are (strictly speaking) introduced or derived from introduced ancestors. Bean's thoughtful paper (Bean 2007) was an attempt to try to make sense of varying concepts of native *vs* naturalised species, and he provided some useful criteria to try to codify this classificatory system. One of his key points was that any human intervention in plant distribution makes the distribution in the new area non-indigenous, and that subsequent distribution to other areas, by any means, also results in naturalised populations. However, plants have always managed to increase their area without human intervention. Some populations spread by natural increase at the margins, others use wind, water or animals to disperse their seeds, sometimes over long distances. He characterised such non-human-mediated spread as natural and therefore the resulting populations as native.

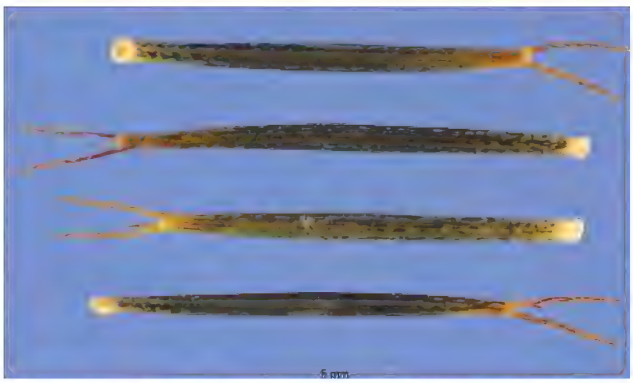

Fig. *Bidens pinnata*. Ph. Steve Hurst (hosted by the USDA-NRCS PLANTS Database)

So what is the story with *Bidens*? Tribe Coreopsideae originated in the Americas. Its highest level of diversity is now in North America. However the first coreopsids possibly arose in South America, spread "naturally" (no humans available) to North America, and there diversified. At some point an ancestral coreopsid evolved traits which set it apart from its fellows, and gradually it generated a population of what humans (if they had been around at the time) might have called "Bidens alpha". Because this species had the key *Bidens* attributes of weediness, it spread (without human intervention, because there weren't any) to other areas, and there, probably quite rapidly because of its short generation time and large seed set, diversified into a range of new species. These species in turn were dispersed, sometimes widely, by furry and feathered animals, hybridising and further diversifying, eventually reaching all continents except Antarctica and (perhaps) Australia. When humans eventually arrived they no doubt helped in this stirring of the *Bidens* distribution pot, but it is unlikely their contribution was as significant as that of migratory birds and mammals.

Bean's thesis adopts an anthropocentric view of native *vs* naturalised species, in which "natural" dispersal results in native species, human dispersal results in naturalised species. The first *Bidens* species almost certainly arose in the Americas. Many however consider that some East Asian taxa are native there. The implication thus is that *Bidens* travelled from the Americas by "natural" means, presumably by overland migration across the Bering Strait, or by long distance dispersal (?birds) across the northern Pacific. Or perhaps they were unwittingly carried across the Bering Strait by early humans, in which case they are naturalised in East Asia. Some of these species, or their close relatives, found their way south to Indonesia and New Guinea. Whether they got there by human intervention, or whether they travelled on some of the many birds that migrate backwards and forwards from Siberia to Australia, is unknown. If they travelled on a bird to East Asia and later to New Guinea, Indonesia and Australia, by Bean's criteria they are native in all these places. If humans were involved in any of these steps they are naturalised in these places, but we cannot know whether this is so. Once *Bidens* species were in, for example, New Guinea, "natural" dispersal across Torres Strait for species with such superbly adapted grapnel seeds is a trivial matter, and once established in Australia further dispersal by a large mammal population is also easy.

Of course, human contact between Asia and northern Australia long predates European settlement. Humans and their associated hairy dingos crossed Torres Strait at least once 30,000 or more years ago. I have previously documented the case of *Spilanthes anactina* (Orchard 2013a) which was almost certainly transported to northern Australia by Macassan fishermen. The first *Bidens* might have arrived in a similar fashion, but it might just as easily have arrived on a migrating bird. We know that *Bidens* was widely distributed in Australia before 1770. Banks and Solander collected specimens at Botany Bay in 1770, and in 1802–1805 Brown collected others near Sydney and at Pobasoo Island in northern Australia. The distance between these localities suggests that the genus had been in Australia for some time, and given the limited time that each of these collectors had at each locality, there is no suggestion that it was rare at either spot. Of course, there is also the possibility of multiple introductions, natural or not, from the Americas to Asia, from Asia to New Guinea, and from Asia/New Guinea to Australia.

Keighery suggests that transport of *B. bipinnata* to Asia might have occurred via Asian contacts with North America in the 16th and 17th centuries, making it naturalised in Asia, and thence in Indonesia, New Guinea and Australia. It is generally thought that the Chinese made only one or at most a handful of voyages between China and North America during the Ming dynasty, whereas the Bering route was available for thousands of years. From the 16th century Dutch, Spanish, Portuguese and British ships opened trade routes from the Americas to southern Asia, and transport by some of these ships is possible. On the other hand, it is notable that several *Bidens* species are considered by multiple authors as native outside the Americas. For example, *B. tripartita* is considered to be native to Europe, Asia and northern Africa. *Bidens repens* is considered native from northern and eastern India to Korea, China, Philippines, Java and New Guinea. *Bidens bipinnata*, as discussed above, is considered by some to be native to eastern Asia. All of these taxa (or their ancestors) must have migrated out of the Americas "naturally".

In summary, transport of *Bidens* out of the Americas to East Asia was most likely by mammal/bird transport across the Bering Strait land-bridge / island chain that linked North America and northern Asia at least 30,000 years ago when humans migrated into North America. This migration was probably two-way for a time, so human involvement in the transport of *Bidens* seeds westwards is possible, but transport by birds, bears, caribou etc is probably more likely. The chances therefore are that under Bean's criteria, the Asian populations of *Bidens* are to be characterised as native. It is known that several species of birds have regularly migrated from Siberia/Asia to Australia for thousands of years, and provide a credible means of transport from Asia to New Guinea and Australia for the adhesive seeds of *Bidens*. This is not to discount the possibility that secondary, human-mediated introductions (Macassan fishermen, Dutch and Portuguese ship wrecks, Chinese exploration of the north coast) have also occurred, but there seems to be no easy way of proving this either way.

The important point is that there is a credible possible mechanism for *Bidens* to have reached Australia without human intervention perhaps as early as 30,000 years ago. The annual life cycle of most species thus provides for tens of thousands of generations of the plants in this country, plenty of time to spread widely, and perhaps to evolve novel infra-specific taxa.

I have not commented so far on the classification and nomenclature of *Bidens* in Australia. The only worldwide revision of this genus of perhaps 350 species (Sherff, 1937) is chaotic and very difficult to use, as it is arranged geographically, not taxonomically. Later authors like Ballard (1986), working on American populations of some of the species thought to be also present in Australia, have found difficulty in resolving their taxonomy, even in their homelands. Some species (*B. aurea*, *B. alba*, *B. tripartita*) are easily identified and have only been recorded in Australia in recent years. They are undoubtedly naturalised under Bean's criteria. The problem arises with the other three species, *B. pilosa*, *B. bipinnata* and *B. subalternans*. Identification of these taxa turns mainly on leaf characters: simple, 3–5 lobed, pinnate or 2 or more pinnatifid or pinnatisect, or bipinnate. Although I had access to most existing *Bidens* specimens in Australian herbaria when preparing the compilation, only a relatively small number could be considered adequate. *Bidens* presses and dries badly. Leaf shape and size varies considerably from base to apex of the plants, and few specimens reflect the full range. Even where numerous leaves are available, through wilting and clumping they are so intertangled as to make their full morphology unclear. In addition, the very thin leaves are extremely fragile when dried, and readily crumble through handling. Older specimens are thus often in poor condition. Characters of the involucral bracts such as colour and hairiness do survive drying, but their significance is moot. The names that I adopted for the *Flora* are those generally used in State and National Herbaria, and were applied without reference to type material. A photograph of

the lectotype of *B. pilosa* and of the holotype and isotypes of *B. subalternans* var. *simulans* are available on-line on JSTOR Plants (if you have access – as a private individual I do not have access other than to virtually useless thumbnails). Superficially they appear to match the concepts adopted in the *Flora*. The lectotype of *B. bipinnata* and the type of *B. subalternans* var. *subalternans* are apparently not available on line. It is likely that some of these names will need adjustment when someone has the time to prepare a full revision. I encourage Greg or anyone else looking for a major project to undertake this revision, but it should be preceded by large scale population studies and collection of well-prepared specimens.

I have shown above that *Bidens* has (potentially) been present in Australia for tens of thousands of years, and has undergone an equivalent number of generations here. This presence may or may not have been mediated by human activities, or may be partly "natural" and partly "unnatural". If it has been here that long, there has been time for local variants to develop at least at infra-specific rank. The case of *B. subalternans* var. *araneosa* is particularly of note. I have not been able to match this taxon with anything described from overseas. It seems to be a home-grown product of Australia. Applying Bean's criteria as Keighery does then produces the bizarre circumstance that *B. subalternans* var. *araneosa* is naturalised in Australia but grows nowhere else! That is, it is at the same time indigenous but naturalised.

Does this semantic argument really matter? For most purposes, no. It only becomes important in a weed-control, conservation context. Keighery notes that *Bidens* taxa, including var. *araneosa* are spreading in herbfields under mulga communities. I don't doubt that this is so, but dispute whether it is evidence of its human-mediated introduction. *Bidens* is doing just what it has always done, hitching a ride on any passing hairy or feathered animal, in this case the thousands of highly mobile cattle introduced to the Pilbara and other places over the last 200 years. Other species have done the same. For example, another asteraceous plant, *Apowollastonia cylindrica*, is an undoubtedly native species, naturally occurring from the Kimberley to Queensland south of the Gulf of Carpentaria (see Orchard 2013b). It is found on heavy clay soils, often in damp situations, and has in recent years expanded its range locally by colonising watering points and irrigation channels. Isolated records have also been made from places as far afield as the mouth of the Gascoyne River in Western Australia and near Ayr in eastern Queensland. These outlier naturalised populations are probably associated with transport of cattle, fodder or irrigated crop produce.

Bean's criteria work well for species with limited ability for long-distance dispersal. They are less useful for plants like *Bidens* which are capable of travelling long distances without human assistance. For these plants we can never be sure how they got to their present localities, except in rare situations where a recent introduction is documented (for example, *B. aurea* was not recorded in Australia until about 1956).

Which brings me to the title of this paper. The *B. bipinnata/B. subalternans* complex has been in Australia for at least 200 years, and perhaps as much as 30,000 years, reaching here by means unknown, perhaps involving human mediation, perhaps not. It appears that the longer time interval is more likely, as a putative native taxon, *B. subalternans* var. *araneosa* has had time to differentiate. By Bean's criteria this variety and its parent species may be native or naturalised. But if it has been here for thousands of years is it logical to consider it an alien? Even Border Force concedes that boat people of 200 years ago, and their descendants, are citizens.

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A milestone

Our quiet achiever Dr Barbara Briggs reached another milestone late last year although it is one she probably prefers not to dwell on. She turned 80, but quietly frustrated our attempts to organise a celebration of this at the Gardens by going travelling for a month or two, as is her wont.

Barbara retired from the position of Senior Assistant Director Plant Sciences here at RBG Sydney in 1997 after nearly 37 years as a botanist and administrator. Since then, she has continued her research studies, mainly on Restionaceae, as an Honorary Research Associate. To me, she seems to have maintained an admirable balance between her research, her travels to the farthest reaches of Australia and overseas, and other activities such as yoga and choral singing.

She continues to be an admirable example to us all, and we look forward to her research going on for many more moons. Good on you, Barbara!

Karen Wilson
Royal Botanic Gardens and Domain Trust, Sydney

Fig. The party celebrating Barbara Briggs turning 80. Left, Barbara Wiecek, Barbara and Leonie Stanberg; below, Barbara's speech. Ph. Leonie Stanberg

News

Algal designs – and a hint of a new herbarium for Melbourne?

No prizes for guessing what the well-dressed Melbourne botanist will be wearing these days. Two algal species have provided textile artist Tamara Schneider with inspiration for designs for a range of luxury handmade Italian silk accessories including ties, bow ties, pocket squares, and scarves. Marketed as a collection by Henry Bucks in collaboration with Royal Botanic Gardens, Victoria, some of the proceeds from sales will contribute to the raising of funds for a new herbarium building.

Web ref. *www.rbg.vic.gov.au/news/henry-bucks-launches-new-pop-up-store*

Fungal accolades for Tom May and Pam Catcheside

Congratulations to Tom May who was awarded the Natural History of Australia Medallion for 2014 by the Field Naturalists Club of Victoria (Web ref.). The medallion is awarded each year to the person judged to have made the most meritorious contribution to the understanding of Australian Natural History and recognises not only Tom's contribution to scientific research at the National Herbarium of Victoria but also his role in the founding and continued growth of Fungimap, now one of the largest citizen scienc citizen science groups in Australia.

And congratulations also to Pam Catcheside who has been selected for inclusion in the 2015 South Australian Women's Honour Roll. The Honour Roll pays tribute to South Australian women who have made a significant impact on their community. Like Tom, Pam is heavily involved in *Fungimap* at a national level, but also, some years ago, first convened the now very active local Adelaide Fungal Studies Group with their meetings, forays and workshops during the fungal season. When not involved with the group, Pam conducts her own research in various areas of the state and invariably arouses local interest. This year, for example, because of Pam's influence, the Kangaroo Island art group chose fungi as their theme for their annual exhibition as part of the South Australian Living Artists Festival.

Web ref. *www.rbg.vic.gov.au/documents/Gardens_mycologist_awarded_Australian_Natural_History_Medallion_approved.pdf*

Tanya Scharaschkin wins award

Congratulations to Tanya Scharaschkin for winning the People's Choice Award in the 2015 Queensland University of Technology Nikon Small World Competition (Web ref. 1). Tanya won with one of her plant anatomy images, some of which can be seen on the web (Web ref. 2).

Tanya has translated some of her images into items for sale in aid of the only hospice in Pakistan providing free care for those who are terminally ill, mobility impaired or destitute. For some Christmas ideas take a look at pp. 10–11.

Web references

1. *www.qut.edu.au/institute-for-future-environments/about/news/news?news-id=94483*
2. *www.flickr.com/photos/ifequt/sets/72157655405248188*

Fig. Tanya with the People's Choice Award

Another botany school bites the dust

In January 2015 the School of Botany at The University of Melbourne met a similar fate to other Botany Schools in Australia, and around the world. Based on a decision from above, the school was merged, together with the former departments of Zoology and Genetics, into a larger School of BioSciences

Prior to the merger, the School of Botany was doing extremely well, being among the largest school in the Faculty of Science, in terms of both staff numbers (>100) and research income (> $12 million in 2014).

Formation of the new school has involved substantial administrative and operational changes. Some changes are a direct response to the merger (e.g. Fig. 1), and others reflect a broader restructuring of administrative and technical staff across the university (over 500 positions lost).

So far the merger has had little direct impact on teaching and research in the field of plant science, but reviews of teaching curriculum etc. are currently underway. There have been no losses of academic positions as part of the merger, and there is a strong desire among the botanists to maintain the profile of plant science at the university, including the area systematic botany.

The new school has been led this year by an interim head (zoologist), while an external search for a permanent head, so far including one round of interviews, has proved unsuccessful. A new interim head, Mark Burgman, will commence in January, and the search for a permanent head continues.

Fig. 1 The historic Botany Building at The University of Melbourne has been renamed "BioSciences 2" to align with a new school structure.

Mike Bayly

Flora News

Northern Territory flora online

Check out the new *FloraNT* (*Northern Territory flora online*: Web ref.) at The checklist has been available for some time but is now enhanced by the addition of a search engine enabling browsing by plant name for fact sheets and pdfs containing extra information about a species. Coverage is variable with some species having more information than others, depending on previous publications, such as the Flora of the Darwin region, but this is a work in progress. It is also possible to do a search of spatial data enabling the production of a list of specimens from a particular area or a particular latitude and longitude.

Web ref. *http://eflora.nt.gov.au.*

Viclist to VicFlora

The previous census of Victorian plants, *VicList*, has now morphed into *VicFlora*. This too is a work in progress and currently consists of a census of current names, conservation status for Victoria's vascular flora and keys for identification. For each taxon there is a profile page with much of the information drawn from the 4100 species descriptions digitised from the printed *Flora of Victoria*. However, since publication of the hardcopy volumes of the *Flora of Victoria*, there have been over a 1000 new species recorded for Victoria. Over a three year period additional descriptions, comparable to the 4100 existing descriptions, will be written by staff and a botanist supported by Royal Botanic Gardens (RBG) Foundation, a grant from the Commonwealth Government's Bush Blitz Tactical Taxonomy scheme, and RBG Victoria funding. Keys for identification are also being updated at this time. Images including illustrations, photos and scans of specimens, will be added to profile pages as they become available [Modified from web page].

Web ref. *http://data.rbg.vic.gov.au/vicflora/*

New edition of the Vascular Plants of Tasmania

A new edition of the *Census of the Vascular Plants of Tasmania, including Macquarie Island,* is now available online as both a printable PDF file and a sortable Excel spreadsheet. It includes 13 taxa new to either Tasmania or Macquarie Island, 12 nomenclature changes, and 4 status changes. It takes the total number of Tasmanian vascular plants to 2794, of which 1899 are considered native to the State (including 528 endemics), 880 are considered naturalised to some degree, and 27 are considered to be extinct in Tasmania. The Census is bookmarked by family, and also contains an index of genera and families. Copies can be downloaded from the web.

Web ref. *www.tmag.tas.gov.au/collections_and_research/tasmanian_herbarium/tasmanian_herbarium_publications*

Flora of New Caledonia

For anyone interested in the New Caledonian flora, you may not have seen a very useful website which lists and depicts their flora and fauna (Web ref.) as well as providing links to recent papers. You can also subscribe to their new newsletter [Brought to our attention by Karen Wilson].

Web ref. *http://www.endemia.nc/*

Taxonomy in our media

It's great to see our Herbarium and Gardens heads actively promoting our science on Australia's national broadcaster, the ABC.

A radio interview about how the under-funded and out-of-favour science of taxonomy underpins all the research across the life-sciences and in fact, is the foundation for our whole understanding of life on this planet (Web ref. 1). Brett Summerell represented the plant and fungal interests.

An earlier interview with Tim Entwisle dealt with some of those more interestingly named plants (Web ref. 2).

The Western Australian Herbarium has been active in publicising its botanical discoveries. An interesting approach has been their foray into Citizen Science. By reference to the discovery of a possible new *Triumfetta* species by Steve Dillon and Kevin Thiele, they are calling for help from the public in locating more of the *Triumfetta* species and also to make observations on the pollinators of the many *Ptilotus* species in the state (Web ref. 3). Also promoted on the ABC were the seventeen new species of *Caladenia* described from Western Australia (Brown & Brockman 2015) in the latest issue of *Nuytsia* (Web ref. 4) and the newly described *Angianthus globuliformis* M.Lyons & Keighery (2015), also in *Nuytsia,* highlighted as the 10,000th native plant species in Western Australia (Web ref. 5).

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Web ref. 1. *www.abc.net.au/radionational/programs/offtrack/taxonomy/6687850*

Web ref. 2. *www.abc.net.au/radionational/programs/blueprintforliving/what27s-in-a-botanical-name/6416426*

Web ref. 3. *www.abc.net.au/news/2015-08-25/pilbara-botanists-discover-new-species/6720862*

Web ref. 4. *www.abc.net.au/local/photos/2015/08/21/4297849.htm*

Web ref. 5. *www.abc.net.au/news/2015-08-12/rare-daisy-angianthus-globuliformis-10000th-native-plant-species/6690050*

Doris Sinkora – a remarkable life

For those of you familiar with the name Doris Sinkora, formerly of the National Herbarium of Victoria and usually associated with algae or Mueller, here is the background to another remarkable person within our larger botanical community, presented in a two part series on ABC Radio (Web refs. 1, 2).

Web references

1. *www.abc.net.au/radionational/programs/earshot/botanist-who-was-expelled-from-hitler-youth/6885034*
2. Sinkora – second part. *www.abc.net.au/radionational/programs/earshot/mrs-seaweed---part-2/6861476*

Alex George's garden on ABC

Alex featured in an episode of the televison programme *Gardening Australia* in September

this year. In case you missed it, it is still available on the web.

Web ref. *www.abc.net.au/gardening/stories/s4310539.htm*

Moustached Kingfisher causes controversy

And not so far away in the remote areas of the Solomon Islands, there was a huge controversy in the media in October over the Moustached Kingfisher. Christopher Filardi of the American Museum of Natural History had been searching for the apparently elusive male bird for 20 years (only 3 female collections from the 1900s existed) and when he found one at the beginning of October he photographed it, recorded its song and then, having established from the local people that it was relatively common, turned it into a specimen (Web refs. 1, 2). Whether he should have done so or not stimulated all of the usual debate which arises when "cute and cuddlies" are involved; had it been a millipede or a plant it probably would have engendered little interest.

Web ref. 1: *www.theguardian.com/science/2015/oct/17/rare-bird-killed-saving-species*

Web ref. 2: *www.huffingtonpost.com/marc-bekoff/ridiculously-gorgeous-rar_b_8201720.html?ir=Australia*

New Zealand deer hunters fail taxonomy test

New Zealand has two rail or swamphen species which look rather similar, the Takahe and the Pukeko. The first is an endangered flightless indigenous bird of the South Island with only 300 known to exist. A small number had been translocated to the predator-free Motutapu Island, near Auckland. The Pukeko is a widespread abundant species which can also be aggressive toward native species and a cull of these was undertaken on Motutapu Island by the local deerstalker's association. Despite instructions on how to distinguish between the species and for only birds on the wing to be shot, four takahe were killed in the cull.

Web ref. 1. *http://m.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11500322*

Web ref. 2. *www.abc.net.au/news/2015-08-21/endangered-species-accidentally-killed-in-new-zealand-bird-cull/6716330*

Miscellanea

Threats to plants, particularly orchids, by illegal trade in SE Asia and Iran

Concern about the illegal trade in many ornamental plants, but particularly orchids, has been expressed by two National University of Singapore academics (Phelps & Webb 2015).

> For many people, plants simply fail to garner our concern and affection in the way that many animals do. While we increasingly hear about the illegal trade of elephant ivory, rhino horn and tiger parts, few people will have heard about the illegal trade in hundreds of plant species for horticulture and medicine. Yet, commercial illegal trade is an immediate threat to the conservation of hundreds, if not thousands, of plant species in our region. (Quote from Webb in Web ref. 1).

While the harvesting in Southeast Asia is more for horticultural or medical purposes, the harvesting in Iran of orchid tubers is mostly for traditional medicine or ice-cream production, although there is apparently an increasing export market. The current quantities of orchid collection there are unsustainable (Ghorbani et al. 2014).

Reference

Ghorbani, A., Gravendeel, B., Naghibi, F. & de Boer, H. (2014). Wild orchid tuber collection in Iran: a wakeup call for conservation. *Biodiversity and Conservation* 23: 2749-2760

Phelps, J. & Webb, E.L. (2015). "Invisible" wildlife trades: Southeast Asia's undocumented illegal trade in wild ornamental plants. *Biological Conservation* 186: 296-305. *www.sciencedirect.com/science/article/pii/S000632071500141X*

Web ref. 1: *www.natureworldnews.com/articles/16761/20150917/illegal-wildlife-trade-wild-orchids-go-unnoticed-southeast-asia.htm*

Papua New Guinea tok

Anniversaries for PNG and its National Herbarium

Papua New Guinea celebrated 40 years of independence on 16th September 2015 (Web ref. 1). And how fitting that Australia will provide $25 million over four years to support the upgrade of PNG's foremost national cultural institution, the PNG National Museum and Art Gallery (Web ref. 2), although it would be even better if the herbarium in Lae were also to benefit from this largesse. That institution is celebrating 50 years of existence this year. An informative article on the herbarium was published in *The Plant Press, Newsletter of the Smithsonian National Museum of Natural History*, in 2013 (Web ref. 3).

Web references

1: *www.abc.net.au/news/2015-09-16/timeline-of-papua-new-guinea-road-to-independence/6748374*
2: *http://asopa.typepad.com/asopa_people/2015/09/australias-40th-birthday-gift-to-png-25m-for-national-museum.html*
3: *http://nmnh.typepad.com/the_plant_press/2013/01/trails-and-trials-in-papua-new-guinea.html*

"Telefomin trousers"

Penis gourds were a feature of an expedition to the remote Star Mountains involving the Lae and Leiden Herbaria in 1975, being often worn by villagers (Fig. 1). One of those illustrated here, presumably worn while working, is perhaps brutally brief, while the other is longer and perhaps more used on social occasions. An article on penis sheaths (or phallocrypts) in *Botanical Electronic News* earlier this year (Web ref. 1) reminded us of this. Photograph captions accompanying that article indicated that the "trousers" are now seldom worn in everyday life in Papua New Guinea but they are still encountered at cultural shows and as artefacts for sale. The photographs also seem to indicate that they have become much more exaggerated, presumably to attract

Fig. 1. Traditional dress in the Star Mountains, 1975 at Busilmin village, c. 1500 m, with Mt Scorpio[n], c. 3800 m, in the far background. (Original slide out of focus). Ph. Bill Barker

attention and satisfy a tourist market, and are not really representative of what was worn in the past in traditional life. Some are even now made from cow horn. They are usually made from the calabash gourd, *Lagenaria siceraria* (Cucurbitaceae), also cultivated as a vegetable, but bamboo and coconut have also been cited as sources in Powell (1976). This species is used in many ways around the world, but it seems only in New Guinea for this purpose.

A more informative account of traditional use in this field can be found in a study conducted in 1992 in West Papua (Milliken, undated).

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Web ref. 1: *www.ou.edu/cas/botany-micro/ben/ben490.html*

A pecking order

In 1882, the journalist W.J. Sowden accompanied and reported on a South Australian parliamentary trip to view progress in the Northern Territory, then part of South Australia. His published account of that journey (Sowden 1882) indicates one of the [alleged] perils of collecting in New Guinea at that time, particularly if you were Chinese.

> It is plucky of these Chinamen to go to New Guinea and get curios—more plucky than it was in D'Albertis[1] to explore the island, because that gentleman knew the Papuans had in war council assembled reluctantly decided that he would be rather too tough eating to make it worth their while to kill him except for amusement, and that even that was risky fun. The Chinese have no such consolation. Before they began a connoisseur near Port Moresby assured them, and also a friend of mine who has a pearl station thereabout, that roasting-cuts of plump Celestial in prime condition, not opium-tinged too greatly, are worth some pence per pound more than the best joints of European. The latter tastes too much of tobacco, they say.

[1] Luigi d'Albertis (1841–1901) was an Italian explorer and naturalist and in 1880 published a two-volume work, *New Guinea: what I did and what I saw*, on his experiences in New Guinea. A recent account of his work, which contains a rare account of how he and his actions were viewed by the local people, can be found in Gnecchi-Ruscone (2011). A number of New Guinea animals and plants bear the d'Albertis name, including a bird of paradise and a python, but the most striking in the plant world is the wonderful D'Albertis creeper or flame of the forest vine (*Mucuna* spp.).

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Are 75 percent of Australia's living species unknown?

A great innovation by the ABC has been the introduction of a "fact check" that tries to get past the "spin" of modern politics and discover the reality.

One fact check from 2014 that we've not referred to previously tested an assertion of a Greens politician that 75 percent of organisms in Australia are unknown to science (Web ref. 1). The assertion and the check relied on no more authoritative a source than the CSIRO (Morton et al. 2014) which in turn drew on Chapman's (2009) estimates for different organismic groups. About 89% of flowering plant species were calculated as known to science, in line with vertebrates (fishes 85%, the rest 95%). Fungi and insects were estimated as 24% and 30% known. What would a survey that involves consultation with specialists working up families and generic revisions come up with today?

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Web ref. 1. *www.abc.net.au/news/2014-09-07/75-per-cent-of-species-unknown-fact-check/5649858*

The daisies are older than you think

A recent article pushes the origin of the first daisies back to the Cretaceous. This article (Barreda et al., 2015) is only available on subscription but you can see a brief report at Web ref. 1.

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Web ref. *www.abc.net.au/science/articles/2015/08/11/4288322.htm*

3D printing

I hadn't appreciated just how much impact there would be by 3D printing until recently (Web ref. 1); there are applications ranging from body parts and prosthetics to food, fashion, transport and housing amongst others, but some of my favourites are the reproduction of artefacts and historical sites destroyed by ISIS and the building of replacement coral reefs in Monaco. Monash University is now producing skeletons and anatomical body parts for medical students using 3D printing (Web ref. 2). But what applications might impinge on our science? Two of those encountered were the construction of 3D images of Foraminifera and Ostracoda type specimens for use in research and teaching, but also in science communication (Web ref. 3). Another, the reconstruction of the skeleton of new dinosaur species (Web refs. 4, 5). Clearly this technique will prove invaluable to museums, in preservation and in display, but hopefully also in making available more of those precious objects that never, or rarely ever, appear in displays. And microscopically, how fantastic it would be to be able to print out some larger copies of those inspiring pollen and seed images we all know, or to produce some of the plant anatomical detail for teaching purposes.

Web references

1: *www.3ders.org/*

2: *www.med.monash.edu.au/news/2015/3d-printed-anatomy-kit.html*

3: *https://gsa.confex.com/gsa/2015AM/webprogram/Paper265890.html*

4: *www.3ders.org/articles/20150924-new-dinosaur-species-reconstructed-thanks-to-3d-printed-bones.html*

5: *www.3ders.org/articles/20150917-newly-discovered-dinosaur-species-skeleton-completed-with-the-help-of-3d-printing.html*

Alice Springs native gardens celebrates anniversary

The Olive Pink Botanic Gardens has been open to the public for 30 years (Web ref. 1); a celebration was marked by the release of a new guide book (web ref. 2) featuring a new map, walks in the garden, a reminiscence of Olive Pink by Peter Latz and profiles of plants which can be found in the garden.

Web references

1: *www.abc.net.au/local/stories/2014/11/05/4122104.htm*

2: *http://opbg.com.au/wp-content/uploads/2010/02/OPBG-Visitor-Booklet-2015.pdf*

Updated classification of Orchidaceae

A higher classification of Orchidaceae has been published by Chase et al. (2015). There are 736 genera recognised worldwide and these are listed in their subfamilies, tribes and subtribes at the end of the paper.

Reference

Chase, M.W., Cameron, K.M., Freudenstein, J.V., Pridgeon, A.M., Salazar, G., van den Berg, C. & Schuiteman, A. (2015). An updated classification of the Orchidaceae. *Bot J. Linn Soc.* 177: 151-174. *http://onlinelibrary.wiley.com/doi/10.1111/boj.12234/epdf*

Accessing names published in old Botanic Gardens seed lists

For anyone who has had to track down a new plant name published in a Botanic Gardens seed list of the 1800s this is a fantastic resource. Such lists are often difficult to find because of their limited print run and

ephemeral nature and none of the older libraries in Europe has a complete set of them. Cees W.J. Lut, the former Chief Librarian of the National Herbarium of the Netherlands, has gathered together as many of these as possible and they are now accessible through a searchable database; each name has been linked to the original description together with the title page of the seed list and its date of publication.

Web ref. Guide to the plant species descriptions published in seed lists from Botanic Gardens for the period 1800 - 1900. *http://seedlists.naturalis.nl/*

Artists inspired by work in herbaria

Herbaria can bring inspiration to those few artists who get the chance to work in them. Sculptor Natalie Maras's work, "Fruiting Bodies", was inspired by working with mosses in the herbarium in Canberra (Web ref. 1).

In a similar way, artist Lisa Waters of the State Herbarium of South Australia has been inspired by the algal collector Jessie L. Hussey. Some of Lisa's work arising from her study of this collector can be seen on the State Herbarium of South Australia site (Web ref. 2).

And if the subject of herbaria as places of inspiration for artists is of interest see Flannery (2013) where this subject is discussed at length and further examples given.

References

Flannery, M.C. (2013). The Herbarium as Muse: plant specimens as Inspiration. *Biology International* 53: 23-34. Downloadable at *http://biologyinternational.org/wp-content/uploads/2013/08/Flannery-Vol-53.pdf*

Web ref. 1. *www.abc.net.au/news/2015-10-16/qbn-sculpture-moss/6859770*

Web ref. 2. http://know.ourplants.org/news/art-about-jessie-l-hussey/

A work "Herbarium" not so inspired?

For a bit of whimsy that does not seem to have been inspired by a local herbarium – and even if it was it is not clear how – have a look at Olga Vareninikova's book entitled "Herbarium". It shows her floral murals in the bus stops along the Belarusian Road R70 [possibly P70 from looking at the map] towards the town of Gorki in eastern Belarus.

Web ref. *www.blurb.com/b/4548086-olga-varennikova-herbarium* [Pressing on preview shows the whole book].

Teaching economic botany

David Mabberley has just completed his second 2-day Economic Botany Today master class at the Adelaide Botanic Gardens. Limited to 16 participants, the class explores that broad topic of the relationship between plants and people, including food, textiles, medicines, drugs, dyes, pesticides and perfumes and there is probably not a better person to teach such a subject.

Wine writer Philip White, who attended the 2014 Master Class, reviewed the course (Web ref.).

Web ref.: *http://drinkster.blogspot.com.au/2014/11/amazing-days-with-david-mabberley.html*

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Obituary

The life and letters of Laurie (L.G.) Adams

Maggie Nightingale
Australian National Herbarium, Canberra.

Laurence G. Adams (Laurie), an early and long-time staff member and Honorary Research Fellow of CSIRO herbaria, and a competent field biologist widely known in the Canberra community for his in-depth and readily shared knowledge of Southern Tablelands plants and many others, died on 7 Nov 2014, aged 85 years. A short notice and tribute appeared in *ASBS Newsletter* 160. This article seeks to further illuminate Laurie's life, and provide a small insight into the workings of CSIRO herbaria during the 1960s and 1970s, as suggested by carbon copies of official letters, hand-written by Laurie in his classic cursive writing, which were found in a notebook in his office after his death.

Fig. 1. Laurence G. Adams in 2004. Ph. M. Fagg © ANBG

Laurie was born in Luton, Bedfordshire, United Kingdom, in 1929, and attended school in Dunstable during WWII, followed by an Engineering and Maths correspondence course in 1946–47. In 1952 he qualified with a National Certificate of Mechanical Engineering (equivalent of Diploma today) from Luton College of Technology (now Bedfordshire University) (Web ref. 1), having also worked as an apprentice mechanical engineer during his years of study. This was followed by employment as an Airframe Mechanic with the RAF at Duxford, Cambridgeshire, and then as an engineering plant draftsman up until 1959, when he migrated to Australia. Laurie worked as an engineering design draftsman in Queensland for most of his first three years in the country. During this time he studied first year botany, chemistry and physics at the University of Queensland, and produced detailed botanical and other drawings of high quality for his class exercises. These clearly demonstrate his enthusiasm for and devotion to botany and his eye for detail, enhanced by his experience as an engineering draftsman. Before leaving the UK he had already made many botanical collections and investigated methods of mounting specimens, and it seems from his letters that he donated 300 mounted specimens to Luton Museum Herbarium (LTN). At least two of these are cited in the Flora of Bedfordshire (Boon and Outen, 2011). Floras of many English counties featured in his book collection. He had been a member of the Botanical Society of the British Isles since 1957.

Surveys and herbarium work

In 1962 Laurie was appointed to the CSIRO Division of Land Research and Regional Survey (DLR&RS), Mainland Survey Group, as a technical assistant in the herbarium (Web ref. 1) which provided botanical identifications for vegetation surveys undertaken by divisional staff in Australia and Papua New Guinea. DLR&RS vouchers account for a large proportion of the PNG and northern Australian specimens in the Australian National Herbarium (CANB), following the amalgamation of the DLR&RS and CSIRO Plant Industry herbaria between 1968 and 1973 (Hewson, 2003; Web ref. 2). The DLR&RS herbarium staff also provided a plant identification service to the CSIRO research stations at Katherine, Humpty Doo and Alice Springs in the NT, and Kununurra in WA, and Laurie's letters also indicated strong cooperative links with state herbaria, particularly those in Brisbane and Sydney and with George Chippendale at Alice Springs. The letters of the late 1960s document some of the exchanges and reveal something of how business was conducted in those days of smaller collections with no assistance (or hindrance) from computer databases. The first is a letter dated 16 May 1966 accompanying seven specimens sent to Mr (S.L.) Everist, Government Botanist at BRI, 'collected by Dr R. Story in the NT during the survey there last year.' A later letter over Ru (R.D.) Hoogland's signature but written by Laurie, again to S.L. Everist at BRI, accompanied a loan of eight specimens 'being material not represented at BRI of our collections'. Loans to other herbaria usually did not include specimens for which the destination herbarium already had a duplicate.

Duplicates and fragments were sent to various botanists around Australia for determination, and expertise around Australia was shared, as there were insufficient specimens already in the collections for comparison, and far fewer reliable references. Eighteen species identified at DLR&RS from a packet of specimens submitted by amateur NT botanist Bill Walsh in 1966 included several that were 'poorly represented in our collection' and three were 'completely new to us'. These associations and contacts as well as the northern surveys were critical for building up the collection. On 30 Nov 1967 Laurie wrote out a letter for Ru Hoogland, to the 'Director & Chief Botanist of NSW' (Royal Botanic Gardens and National Herbarium, Sydney) regarding despatch of three Adams specimens of *Eucalyptus,* from the Deua River catchment, south of Araluen, which were in urgent need of determination for the survey report. The Australian National Herbarium's specimen database indicates that these dets were provided promptly – one is still current, from 'NSW' in '1967'. This was before Ian Brooker and Andrew Slee joined the staff at CANB.

Ru Hoogland started to build up the herbarium library during his tenure at DLR&RS from 1952 to 1968 (Web ref. 2). On 7 Feb 1967, Laurie requested two books via a letter to Foyle's Bookshop in London, including W.T. Stearn's *Botanical Latin* – a resource we take for granted these days. A letter written in August 1967 to the Director and Chief Botanist at NSW was entirely devoted to asking about the correct authorship of *Maidenia rubra* – was it (W.Fitzg.) Rendle or W.Fitzg. ex Rendle? Laurie had collected some 'while on a visit to our field station at Katherine'. These days we are fortunate to be able to consult APNI/APC online via the National Species List (Web ref. 3), but underlying that great convenience is the painstaking and time-consuming resolution of many such complicated conundrums by past workers including Laurie. (And the answer to the above question is: the latter.)

In March 1965, Laurie worked with Mike Lazarides on a survey to the northern Stuart Highway area (Nourlangie, Pine Creek, Katherine, Maranboy etc.) of the NT, the Lazarides and Adams team making around 332 collections. Laurie also participated in NT fieldwork in 1964 and 1966. On a trip back to England in June 1966, he worked with Mike (then ABLO) at Kew for four weeks, which he found 'a rewarding experience'. (He later spent most of 1985 at Kew, during long-service leave from CSIRO.) Laurie tried to assist Mike with material for Mike's Masters studies in Chloridinae (Poaceae) but in 1967 'The Tablelands (were) ... in the grip of a drought', as was much of southern Australia. For northern Australian material, Laurie

Fig. 2. Staff at work in the compactus area of the Australian National Herbarium (CANB) in the late 1980s; from left: Laurie Adams, Jo Palmer, Lei McGregor, Greg Whitbread. Ph. © CSIRO.

doubted 'whether most of the personnel [at the Katherine, Alice Springs, Kununurra and Humpty Doo field stations] would be familiar with the species you require' (as the focus of these stations was on agricultural and pastoral research). He tried to germinate seed from sheets held at the Land Research and Plant Industry herbaria but met with no success 'although they have been in petri dishes for over a month'. Mike acknowledged Laurie's support by later naming a grass species (*Micraira adamsii* Lazarides) after him. Mike wrote that:

> *M. adamsii* is named after Mr L. G. Adams, a colleague in the Herbarium Australiense, who has collected extensively in the Northern Territory, central Queensland, and coastal New South Wales, and whose collections of *Micraira* have contributed considerably to our knowledge of the genus. (Lazarides, 1979 or Web ref. 4).

Laurie rose through the grades to a Technical Officer Level 2 by 1976, and 'retired' from paid employment in 1988, but was never long absent from the ANH until his final year. He worked as an Honorary Research Fellow and completed many of his scientific publications after retirement. Earlier in his herbarium career, with the experience of four large surveys to northern and eastern Australia, and his well-developed attention to detail, Laurie became a competent identifier, and took responsibility for many groups including aquatic plants, *Eucalyptus* from northern and south-eastern Australia, Scrophulariaceae, Orchidaceae, Boraginaceae and some large genera in Asteraceae and Cyperaceae, plus several smaller genera. He also undertook duties in maintenance and curation of the herbarium library and map collection, supervision of replicate specimen exchange with other institutions, and cryptogam curation. With the support of the then head of ANH, Bryan Barlow, Laurie undertook a book-binding course several times, in order to have access to the specialised equipment, so that many volumes for the library could be well bound at low cost. Laurie also assisted Greg Whitbread and Judy West with the development of the first computerised specimen database for the Australian National Herbarium. The eventual tally of species newly described by Laurie during his CSIRO employment and his 'retirement'

is 23 (including one, *Ixora baileyana*, jointly described with Diane Bridson). He published an additional 12 subspecies in six families as new, with 12 new combinations at species level and one for a sub-species. Laurie also authored treatments of many more taxa for various Australian and Victorian flora volumes (Web ref. 5). He commenced but did not complete an ambitious project on the *Flora of the South Coast and Tablelands* (FOSCAT) and his checklist formed the basis for the online *Census of the Vascular Plants, Hornworts, Liverworts and Slime Moulds of the Australian Capital Territory* (Web ref. 6). Other tasks during 'retirement' were Flora editing for ABRS, and working as an identifier for the Australia's Virtual Herbarium (AVH) project on Casuarinaceae, Typhaceae and selected genera in the Cyperaceae (including *Carex*, which was a favourite of Laurie's). A map of the collecting localities of Laurie's c. 3700 individual and team collections which have been data based in CANB is shown in Web ref. 1.

Gentianaceae

In Aug 1967, Laurie wrote to Mike Lazarides (no longer ABLO but still at Kew, working on his Masters) asking him to see whether Kew had any Australian material of *Gentiana*, and a month later wrote to the directors of NSW and MEL for 'any information whatsoever' regarding *Gentiana quadrifaria* Blume, particularly the origin of the record by F. Mueller in *Victorian Naturalist* 5(1): 14 (1888). These letters would have been written just after Laurie recognised a gentian seedling at Jerangle, NE of Bredbo in 1967 while on a NSW Southern Tablelands survey with Bob Story, it being 'similar in foliage to gentians back in the UK'. The only Australian gentian mentioned in literature to that date was the one noted by Mueller which had been 'sent to him by the amateur collector Wilhelm Bäuerlen in 1887 from a swamp near Bombala NSW'. (MEL does hold the holotype, and NSW the isotype, of the later-named new species *Gentiana baeuerlenii* L.G.Adams). Within the next few years, two other un-named species were collected, making four in total, and Laurie undertook a revision with John Williams of UNE (Adams & Williams, 1988), with John naming a species which had been collected on the Northern Tablelands on New South Wales. In an article in No. 24 of this Newsletter, Laurie paid tribute to Bäuerlen, an amateur (and later professional) collector and one-time postmaster at Bombala NSW, by analysing the variable latinised spelling of his name in four Australian plant genera and suggesting corrections (Adams, 1980). This foreshadowed an increasing interest and expertise in Latin and Greek which was of great value to other herbarium staff and culminated in the publication of 'Laurie's Latin', an English/Latin/Greek glossary, on the web (unfortunately not currently available).

Laurie had a 'Eureka!' moment in his botanical career in May 1992. Lagging behind near the end of an NPA (National Parks Association of the ACT) bushwalk in the Orroral River valley in Namadgi National Park, he was crossing some swampy ground, with his usual eyes-down posture, and came upon another population of Wilhelm Bäuerlen's long-lost gentian (Adams, 2010 or Web ref. 7). Twenty plants were later counted, but sadly, the colony gradually shrank and none were recorded in the ten years to 2010 (due to the long drought of the 2000s). A delight similar to that earlier find was a report (and collection) from Jo Palmer, after a weekend walk to Square Rock in Namadgi in 1994, of a population of *Chionogentias sylvicola (*now *Gentianella sylvicola* (L.G.Adams) Glenny), a tall, rare gentian, previously known from very few collections from the Fiery Range (Broken Cart Fire Trail) in northern Kosciuszko National Park.

While writing the *Gentiana* revision Laurie had become aware that a separate group of native gentians were lumped under one name *Gentianella diemensis* (Griseb). J.H.Willis. Quoting Laurie's own NPA article (Adams, 2010, or Web ref. 7):

> These are the species bearing somewhat larger flowers (all looking rather like white buttercups) … after much local, Victorian and Tasmanian fieldwork, descriptions of 14 species of a new genus called *Chiono-gentias* (snow-gentians) were published in 1995. (See Adams, 1995).

This work was Laurie's *magnum opus*, in

which he described 11 new species and six new sub-species, out of a total of 14 Australian species, as well as making new combinations for 25 New Zealand species of *Gentiana*. In the 1995 paper, Laurie analysed and discussed the complicated generic/ nomenclatural history of the southern gentians at length, from a painstaking investigation of these highly variable and difficult-to-find entities, along with reviews of knowledge on karyology, ecology, floral biology and breeding systems, including pollinators, seed dispersal, vicariance and conservation status, with detailed descriptions of various morphological characters and their different states and taxonomic value. Almost concurrently, the first molecular analysis of the subtribe, sampling four European species of *Gentianella,* plus species from *Gentiana, Gentianopsis* and eight other genera, with *Centaurium* used to root the phylogenies, was being undertaken elsewhere, and was published in the same year (Yuan & Küpfer 1995 in Glenny 2004). This work rebutted Laurie's assertion that the type species of *Gentianella (G. campestris)* did not belong with the rest of *Gentianella,* which underpinned his use of the new name *Chionogentias* for the Australian and New Zealand snow gentians (Glenny 2004). Glenny (2004) reviewed and extended this and subsequent molecular/phylogenetic studies, and his synthesis placed the New Zealand and Australian species in the larger pan-hemisphere genus *Gentianella*, but Laurie's species and infraspecies still stood, the separation of New Zealand species from *Gentiana* was upheld, and the information value of his treatment was little diminished.

Four of the species occur in the ACT, and we saw one, *Gentianella muelleriana* subsp. *jingerensis* (L.G.Adams) Glenny, when walking to the summit of Mt Gingera to scatter Laurie's ashes in April 2015. The flowers were smaller but more numerous than those seen in the same small patch during a reconnaissance walk two months earlier, and the area had seen snow in the interim.

Fig. 3. Laurie the identifier at work in 1978. Ph. George Chippendale © ANBG

Improving the quality of specimens and field notes

Some of the other letters in Laurie's letter record strike a chord with me concerning the scrappiness of some of the material donated by some non-herbarium collectors (although also with poor sectioning and pressing of specimens leading to unnecessary bulk, which Laurie did not address in these letters). Considering the effort it takes to dry, freeze, handle, database, label, mount, folder, check or determine the identity, process duplicates, incorporate and then maintain and care for every herbarium specimen such that it should last for centuries, surviving use by many in a multitude of ways physically and from its data and (in future) image, I feel a grinding sense of wasted opportunity when I see a very small twig of a much larger plant, or only one individual of a very small plant, getting lost on a big white herbarium sheet, far from the edge where a microscope might easily access it, and too stingy to be sampled. The only excuse should be where the label says 'rare'. Similarly, field notes without even the simplest description of habitat or a mention of flower colour, plant height or bark type, or perhaps having only GPS coordinates with no locality description so that one wrongly transcribed digit creates a confusing lie for posterity, miss an opportunity to describe an often changing landscape at a point in time, and to provide

descriptive data useful both for identification and electronic dissemination. Laurie's advice on 6 Oct 1966 to Bill Walsh was:

> You should concentrate on trying to fill each duplicate sheet, not with small pieces, but with as large specimens as is practicable [except where the nature of the species e.g. small annuals means that] one must be content with several small plants or pieces of plants.

Later letters written by Laurie provided determinations for Kimberley Research Station (Kununurra, WA) grass and sedge collections but also stated:

> Your specimens tend to be rather sparse in some cases; the aim should be completeness, as far as is practicable, with ample material to fill the sheet, but without crowding.

This advice is repeated in a later letter.

Determinations dated 14 Mar 1967 and supplied to CSIRO Research Station, Katherine, NT, included *Cenchrus ciliaris* (buffel grass), suggesting that this species was just appearing in the area and was not yet well known. (It had been widely planted in the Alice Springs area in the 1960s for soil stabilisation and pasture, but is now a threat to native vegetation due to its high combustibility and competitive vigour (Humphries et al., 1991)). Personnel at Katherine wanted their own reference herbarium and Canberra was prepared to determine specimens, but 'of course, for permanent record purposes, the specimens would need to be more substantial than the ones herewith'. From evidence in a later letter, Katherine Research Station apparently did ask for collecting materials and Laurie once again provided advice, and a copy of some documentation from the Natural History Museum, London (BM).

> We find that inadequate field notes by inexperienced collectors are a perennial problem. ... For the sake of future citation, the collections should be numbered in a simple linear sequence, starting at No. 1 ...

The next letter, of 29 Apr 1968, over R.D. Hoogland's signature but in Laurie's handwriting, is to the Kimberley Research Station:

> there seems to be some misunderstanding about what constitutes adequate field data for herbarium labels; to help clarify the matter you will find enclosed a few samples of the type of thing we require. Anything less than this greatly detracts from the value of the specimen, particularly if the latter is something unusual or rare. ... I must point out that the time available for routine identification is at a premium in Canberra, and material of inferior quality tends to get ignored.

Some things never change, except perhaps the quality of English expression, and I have to confess that I enjoyed reading Laurie's very precise version.

Other interests

A personal undated letter written about Feb 1967 (date based on other annotation and placement in his notebook) attests to Laurie's interest of gold fossicking – he requested two pamphlets from the Department of Mines in Sydney and enquired about the availability of *Prospectors Guide – NSW*; two copies were subsequently ordered at $1.25 each, plus 13c postage. Laurie's friend Teena says that they often went fossicking on the Shoalhaven, and Laurie's earlier participation in a CSIRO survey in this area may have awakened his interest.

In an article in the *National Parks Association of the ACT Bulletin*, George Chippendale wrote that when he took over leadership of the annual Black Mountain spring walk from Nancy Burbidge,

> I felt I might not know enough about the plants concerned, so I asked Laurie Adams to give me some clues. He willingly spent lunchtime with me on the walk area ... (Chippendale and Geue, 2010 or Web ref. 7).

Laurie assisted enthusiastically with this walk for many years, and Paul Cheeseman, a close friend in later years, wrote:

> For weeks beforehand he would discuss whether it would be a good or a poor flowering season for the Ramble.

Laurie helped many people with floristic surveys throughout the region.

> He was generous with his knowledge and time and happiest when passing his knowledge on to others. (Cheeseman, 2015 or Web ref. 8).

I saw this when he accompanied Sue Mathams

and me on the field trip component of an ANPC grass identification workshop we ran in 2009. Among Laurie's publications is the perennially useful (to Canberra residents and visitors at least) *Trees and shrubs of Black Mountain, Mt. Ainslie and Mt. Majura: a key based on vegetative characters,* last updated in 2010 and available online (Web ref. 9).

Although I met Laurie when I commenced part-time contract work at the ANH in 1991, my most frequent interactions with him occurred during the last nine years of his life, when we ran the Centre tea club together, him shopping and me collecting funds. Laurie was also a regular donor of cakes for morning tea and, in his spare time, enjoyed vegetable-growing, pickling, jam-making and other culinary activities. He actively participated in the NPA and Friends of Grasslands ACT (FOG), as well as studying the racing form guide assiduously and running a Lotto syndicate at the herbarium. Often he could be found discussing the great issues of systematic botany/taxonomy with Max Gray (sadly also recently deceased) and Tom (T.G.) Hartley, as well as anyone else who would listen. To quote Paul Cheeseman (2015) again:

> Until meeting Laurie I had no appreciation that life as a botanist was so exciting, embroiling and dramatic, nor of the life and death battles that took place in learned institutions across the world.

Laurie was passionate about botany but adopted a somewhat grumpy demeanour around the herbarium. This may have been due to taxonomic disagreements, or some earlier disappointments in his personal life, or things just not going along as he thought they should, but those at CANB never took it too seriously. Somehow underneath there almost always seemed to be an element of British humour, perhaps a touch of comedy and farce.

Recently I entered details for *L.G.Adams 1043* into our herbarium and botanic gardens database. This was a collecting of living material (only) of *Nothofagus cunninghamii* (Hook.) Oerst., made in south-west Tasmania in 1980 and written up in an ANBG (Australian National Botanic Gardens) field book. There is one plant of the original, and eight cutting progeny still growing at ANBG. Laurie also visited Tasmania in March 1991 and collected gentians, and in Dec 1977 when he appears to have done general collecting of many taxa, accompanied by C.J. Adams, possibly a cousin, suggesting that this was not a work trip. Seventy-eight collections were made over five days. That was a Laurie Adams holiday!

Acknowledgements

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Web ref. 10: *www.fog.org.au/Newsletters/2015-05newsletter.pdf*

Postscript

Maggie also pointed us to an account of Laurie's Memorial Service on Mt Gingera in the *Friends of Grasslands Newsletter* which is available on the web (Web ref. 10).

Eds.

ABRS report

Staff updates

Director Joanne Nathan will be leaving ABRS in November and returning to the Wildlife Heritage and Marine Division in the Department of the Environment. Dr Sue Fyfe, who is currently the Director of Geoinformatics and Data Services at Geoscience Australia, will take the reins on 12 November 2015. Dr Haylee Weaver has joined ABRS as the new Scientific Project Officer (fauna team), replacing Pam Beesley. Haylee has a PhD in parasite taxonomy and ecology and will be managing taxonomic databases and publications about Australian fauna. Christy Geromboux has also re-joined ABRS as a Database Support Officer on a non-ongoing contract for up to 12 months.

Flora of Australia and the Australasian eFlora platform

The Australasian eFlora platform is being progressed as a partnership between CHAH, ABRS and ALA. The project aims to build infrastructure that will support the collaborative creation of eFlora/s, to increase content sharing capabilities and reduce duplication of effort.

A platform prototype has been developed to enable review of appropriate content and functionality for creating, editing, attributing and delivering content through the eFlora platform. The next phase of development involves testing the platform with real data, including from the *Flora of Australia* and select state and regional Floras. This commenced in August 2015 and will finish towards the end of the year. Testing is being undertaken in a coordinated manner involving representatives of state and national herbaria.

Bush Blitz

Recent expeditions: May 2015: Judbarra/Gregory National Park in the Northern Territory; July 2015: Olkola Country in Cape York, Queensland; September 2015: Kiwirrkurra in the Gibson Desert in Western Australia. The Kiwirrkurra Bush Blitz involved close engagement of Indigenous Protected Area Rangers and Traditional Owners, who accompanied scientists in the field. This provided a unique opportunity to involve Pintubi People, who have a strong traditional knowledge and connection to Country. Other highlights from Kiwirrkurra included documenting new edible insects-host plants associations (by Dr Alan Yen, Department of Environment and Primary Industries Victoria, and his PhD student Conrad Bilney, LaTrobe University), and being filmed for an international documentary series about the six main deserts of the world, called 'Planet Sand' (mainly targeted at a European audience but will possibly be screened in Australia).

Upcoming expeditions include: November 2015: Oxley Wild Rivers National Park in New South Wales; February 2016: Bruny Island and South West Tasmania National Park, Tasmania.

Applications for Bush Blitz taxonomy grants are expected to open in mid November. Information about how to apply will be available at *www.bushblitz.org.au*.

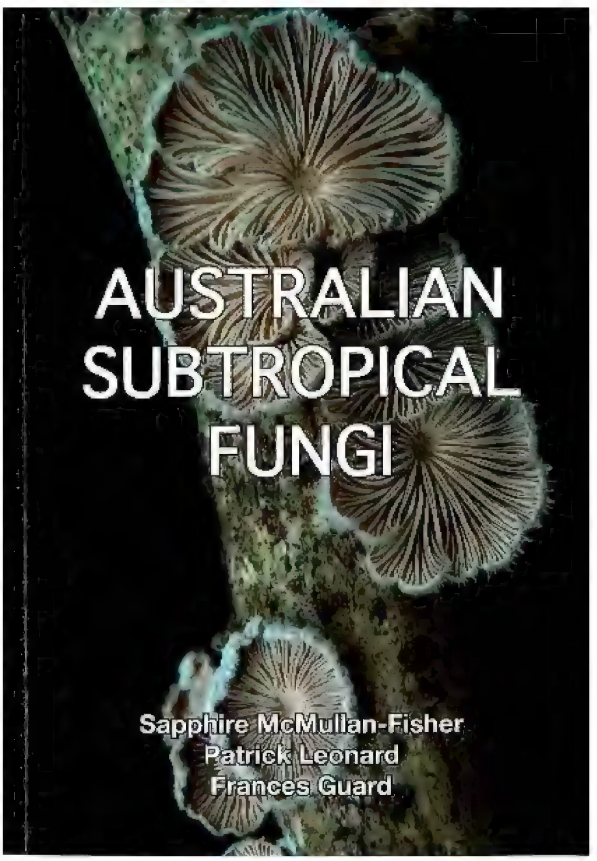
Zoe Knapp
ABRS, October 2015

Book reviews

Having fun with fungi

Reviews by: Betsy R. Jackes
James Cook University, Townsville, Queensland

Australian subtropical fungi
By Sapphire McMullan-Fisher, Patrick Leonard, Frances Guard
Suncoast Fungi, 2014
160pp. ISBN: 9780646915524.
AU $30.00 (paperback)
http://fungimap.org.au/index.php/bookshop/australian-field-guides/subtropical-detail



The guide book *Australian subtropical fungi* is well organized and should be easy to use by anyone curious about that "mushroom like thing". Following the introduction there is a key to "Fungal Forms" which is very easy to use with nice clear diagrams. This then leads the reader into the main body of the book. I am sure that the use of common names for these broad groups based on form will enable the user to feel more at home when they can casually remark "Oh, that is a leather or an icicle".

Each major form group is colour coded for ease of reference. Genera and species are arranged alphabetically within each group. There is a similar layout for each species and essential features are highlighted. For instance: the illustration of *Pleurotus tuber-regium*, an agaric, is followed by a comment on the distinctive features "a large, and tough, funnel-shaped mushroom with white spores. The tall stem with an underground tuber is distinctive". Then, for those who want more detail there are descriptions of the relevant features such as cap, stem, gills, spores and spore prints or in the case of the leathers, the nature of the fruiting body and description of the upper and lower surfaces. All descriptions include comments on substrate, habitat, etymology, how common and some general notes. In a number of the descriptions there are references to the confusing species. If you have an agaric, now is the time to go to *Funkey*!

Print is large and clear, glossary of terms is provided at the back. The Queensland Mycological Society is to be congratulated on producing such a well- presented book with relatively few typographical errors – some italics have been missed and the odd fullstop.

I would have liked to see Group 1 used as a heading on p. 19 the same as Group 2 is used as a heading on p. 20. Although no doubt limited by space, ideally I would like to see some of the 'Notes' expanded, such as, what are the microscopic/macroscopic features required to separate two or more similar species. For only one species, other than the stinkhorns, is smell noted. Why not a comment that *Agaricus austrovinaceus* is easily distinguished by the strong smell of aniseed? This would indicate that it is unusual

to not just smell 'like a mushroom'.

On p. 119 there is the comment to "make sure that *Phallus rubicundus* is not confused with other red species of *Lysurus* or *Mutinus*"; however, *Lysurus mokusin* alone is illustrated on p. 116, while *Mutinus* is not included anywhere, making it difficult to distinguish them. For some entries such differences are noted.

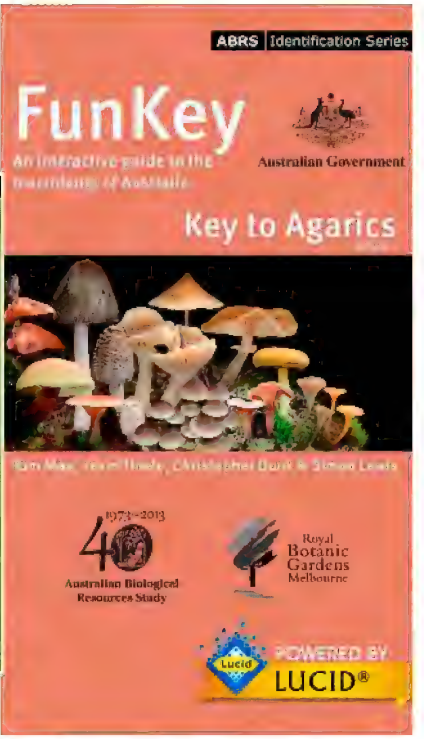
I shall certainly be taking this book with me whenever fungi are likely to be about.

FunKey: an interactive guide to the key to the macrofungi of Australia. Vers. 1.0 Key to the agarics.
By T.W. May, K. Thiele, C.W. Dunk, S.H. Lewis. ABRS Identification Series. Identic, Brisbane and ABRS, Canberra. 2014
1200+ color images for 159 taxa and 363 character states. ISBN: 9780642568779. AU $64.90 (USB 2.0 Key). http://shop.lucidcentral.org/index.php?route=product/product&path=60&product_id=69

I had fun with *FunKey* but alas living in a drought-affected area there were few fresh fungal examples on which to practice so I had to resort to photographs with one exception. The advice to work through the tutorial was sound even if I had to regularly pretend that I had only limited knowledge of interactive keys. I suggest that users should copy the key to the hard drive as soon as possible as I wonder how durable the hinge on the USB drive will be.

I suspect that most users will already be familiar with the main features of agarics, or gill fungi, from using the various guides that have been around, however, the tutorial was easy to follow. Suggest more emphasis on "when in doubt leave it out" rather than "it is best to ignore at first characters you are unsure about", and also don't worry about trying to have only one taxon remaining. While it is satisfying to eliminate all but one, may I suggest that just in case several species are similar then look at all and use the differences button. This also allows for variation in interpretation of characters particularly with respect to colour and when specimens are immature. I would suggest that those who are new to identifying fungi and in particular the agarics, that they take a cultivated mushroom and work through all the characters to familiarise themselves with the diagrams, so that they know and understand the various terms and states.

The product is available in the recent USB form of Lucid products or, for those adept with their smart-phone, downloadable as an "app" for $10.99.



A labour of love continued: Allan Cunningham before Australia (and James Bowie before South Africa)

Review by: David J. Mabberley
Wadham College, University of Oxford, UK;
Macquarie University and National Herbarium of News South Wales, Sydney

King's collectors for Kew: James Bowie and Allan Cunningham, Brazil 1814-1816. ***By A.E. Orchard & T.A. Orchard. Privately published, Weston Creek ACT, 2015. 477 pp. ISBN: 9780994150516. AU $52.00 (paperback)***

For those working in the world's major herbaria, a common label on herbarium specimens, 'King's Collector', refers to the botanist and entomologist, Hermann Kunstler (1837–1887) (incidentally, dying on the way to Australia), employed as a collector by George King of the Royal Botanic Gardens, Calcutta. But here we have '[The] King's Collectors for Kew', of which the first such was Francis Mas(s)on, who was sent to the Cape of Good Hope by Sir Joseph Banks in 1772.

Of later King's Collectors for Kew, Allan Cunningham needs no introduction to Australian botanists (nor does James Bowie to South African ones). But on their appointment to postings, again promoted by Banks – to New South Wales and the Cape respectively, Cunningham and Bowie travelled out together from England via Rio de Janeiro. A short Brazilian visit was envisaged, but their stay grew to two years, 1814–1816, during which time they collected together around Rio and made an arduous overland journey of six months to São Paulo and back, on mules. Their primary mission as collectors was to provide seeds and other living material, complete with herbarium vouchers and field notes, to promote the status of the King's botanic garden at Kew.

The project leading to this book about the Brazilian interlude builds on one initiated by the late Elsie Webster (NSW) and therefore her notes preserved in Sydney. The resulting weighty volume has a Preface including a summary of Cunningham's Australian (and New Zealand) career, with notes on Bowie's in Africa. There follow (unnumbered) introductory chapters, the first dealing with Banks's life, his motivation for promoting the appointment of Kew collectors, and his instructions to them, besides their preparations including buying two guns for five guineas each – and a copy of Persoon's *Synopsis plantarum* (1805–1807) for two. Then comes a short history of Brazil, followed by concise biographies of both Cunningham and Bowie, some of this material repeated from the Preface. Each of the six (unnumbered) chapters devoted to the time in Brazil comprises introductory remarks (some again repeated from the Preface) and the heavily footnoted journals of the two collectors, their accounts (Cunningham's often being the fuller of the two) printed side by side, making for ready comparison.

The bulk of the book is made up of these transcripts of the collectors' official journals ('an amalgam of [the] various drafts' they

prepared) deposited at the Natural History Museum London (BM) and Kew. These are meticulously linked up to the surviving herbarium specimens now mostly in BM and transcribed germane species-lists and letters, especially those to and from Banks and William Townsend Aiton at Kew, correspondence now in various repositories including the Sutro Library in San Francisco. Also transcribed here is a very important and remarkably long, revealing letter from Cunningham to his father.

The author-editors have inserted punctuation but otherwise left the collectors' texts unmodified. Both collectors began each day's entry with a note of the weather (they were both British after all), then some account of their travels and collections, sometimes with quite detailed descriptions, even in Latin. Cunningham in particular refers to the second edition of Aiton's *Hortus Kewensis* (1810–1813), on which he had worked with Robert Brown, as well as Persoon's *Synopsis*.

Although the book's originality and comprehensiveness mean that a small font had to be used, room has been made for illustrations with 12 pages of (unnumbered) colour plates (including the authors-editors' own photos taken in Brazil, besides some of the under-appreciated Bond and Duncanson watercolours of Kew-grown Cunningham plants) bound together in the middle. Black and white illustrations in the text are of nineteenth-century views and *dramatis personae* and, very usefully, some are of herbarium sheets and labels in Cunningham's and/or Bowie's hand.

The book ends with chapters on Bowie's subsequent journal on the way to, and at, the Cape, followed by Cunningham's on the way to, and in, New South Wales, which latter will be of great interest to Australian readers, and finally annotated Appendices of the specimens collected in Brazil and localities the collectors mentioned. Although there is no bibliography (sources are cited in the footnotes), there are excellent indexes.

As is clear from the paragraphs above, there is some repetition in the commentaries in this book. There are also a number of stylistic 'echoes' in the text, occasional typographical or other slips (e.g. 'Boweia', 'Melastomaceae', 'New York Botanic Gardens'), and some errors of fact, e.g. The Napoleonic Wars did not end until 1815 (at Waterloo and Issy), and Ferdinand Bauer did not make two journeys to Norfolk Island. But these are minor cavils from a reviewer faced with this mountain of solid scholarship.

In short, the book maintains the extremely high standards of the Orchards' labour of love that is their continuing work on Cunningham. It joins their privately published (2014) book on their hero in Tasmania and several papers, including one on Cunningham's Timor plants (2013). Indeed it is good to see that this volume, like that paper, concerns work beyond this 'colony', a refreshing manifestation of the importance for Australia of researches outside this country's (or individual states') boundaries – by stark contrast with an increasingly disturbing myopia, and even xenophobia, characteristic of our governments and their lackeys.

Working in the Americas, Australasia and Europe, Cunningham was a truly international figure: it is easy to understand how such a man would be at odds with the pusillanimous New South Wales administration and resign after just a year in his post as Superintendent of the botanic garden in Sydney. Undeterred, though, he stayed in Australia – and continued the major contributions to the botanical exploration of this country and New Zealand, for which he is best known.

How important, though, were the two years in Brazil? Many of Cunningham's and Bowie's collections, particularly those from the São Paulo journey, were spoiled through damp, rot and vermin. On their arrival in England in several shipments, the herbarium specimens - the main interest of the author-editors, reached Banks's collection in Soho Square. But it appears that Banks did not allow his curator-librarian, Robert Brown, to work on them, in the same way he had put a halt to any further work on Brown's Australian collections, such that Brown's unfinished masterpiece, the *Prodromus* (1810) was aborted (as was the monumental book on Australian plants to follow the planned two-volume prodomus and to be illustrated by Ferdinand Bauer, so as to rival Sibthorp's, Smith's & Bauer's *Flora Graeca* (1806–1840), following a similar

two-volume *Florae Graecae prodromus* of 1806–1813).

Brown was to be occupied with collections from the Congo (Banks was prominent on the Africa Committee), though he managed to sneak in some Australian plants even in his work on that. He was also tasked with writing up collections from China and the Arctic. After Banks's death in 1820, though, Brown turned to Cunningham's collections, in particular his Australian Proteaceae for Brown's *Supplementum* of 1830, but, even before that, he described a new jacaranda from Brazil, using Bowie and Cunningham material.

Cunningham and Bowie also sent duplicates to Aiton at Kew. With the review of Kew in the early 1840s and uncertainty surrounding its scientific future (*O tempora O mores*!), Robert Brown rescued those specimens and so those too are now at BM. Some specimens are preserved elsewhere, at least 68 being sent from BM to NY in the mid-nineteenth century, for example. Although Cunningham and Bowie material was used later by e.g. Dunal (*Solanum*) and Miers (Apocynaceae) as types for what they thought were new species, many of the novelties had by then been described as new by botanists using the Brazilian collections of others. This means that most '*cunninghamii*' names of species from Brazil are long-lost in synonymy, as e.g. *Selaginella cunninghamii* (now ?*S. tenuissima*), though one name in current use is *Piper cunninghamii*.

A more lasting legacy may be that resulting from the real motivation for the Cunningham and Bowie mission, the establishing in cultivation of tropical ornamentals via Kew. Although this is not the focus of the book here, it is perhaps helpful to remember that species successfully introduced from Brazil by Cunningham and Bowie included many 'stovehouse' plants, of which two are very important ones worldwide today, namely the gloxinia (*Sinningia speciosa*, Gesneriaceae; perhaps that collected as '*Chelonia* sp?' on 22 Feb 1815) and apparently the common jacaranda (*Jacaranda mimosifolia*, Bignoniaceae), which has made such an impression in Australia.

The Orchards are to be commended for this fascinating volume in their homage to Cunningham, though, as it is such a 'Kew' story, it is perhaps sad that that institution, where they worked on this project (when Tony was Australian Botanical Liaison Officer) had not prepared a similar book long ago (or, indeed, published this one now).

As this book will be of greatest interest to those working on South American (and to a lesser extent, South African) plants, it is to be hoped that some international distribution arrangements, befitting Cunningham, can be made to allow this important book to reach the hands of those who most need it.

Cylindrical-stemmed genera of feral opuntioid cacti naturalised in Australia

Review by: John R. Hosking,
N.C.W.Beadle Herbarium

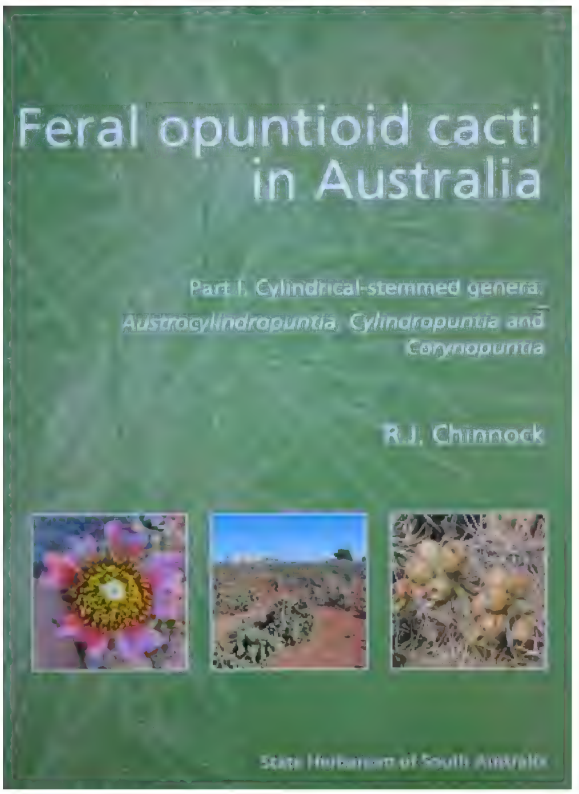
Feral Opuntioid Cacti in Australia. Part 1. Cylindrical-stemmed Genera: Austrocylindropuntia, Cylindropuntia and Corynopuntia. ***By Robert (Bob) Chinnock, State Herbarium of South Australia, Kent Town, South Australia. 69 pp. ISBN: 9781922027436 (paperback) www.environment.sa.gov.au/Science/Science_research/State_Herbarium/Resources/Publications/Books/Feral_opuntioid_cacti_of_Australia_Part_1***

This is the first of two booklets on naturalised opuntioid cacti in Australia. The booklet is in three parts, an introduction, a largely pictorial field guide and a detailed taxonomic section. I very much enjoyed this publication, partly because I worked on cacti for many years.

The introduction is broken into a number of sections. There is a very brief historical background. An unknown cactus was brought to Australia by Captain Arthur Phillip in 1788 as a food source for a cochineal dye industry. From various sources this cactus is most likely

to have been *Opuntia monacantha* (at times known as *O. vulgaris,* but this name is apparently based on *O. ficus-indica* and so should not be used for *O. monacantha*). This cactus is reasonably common around Rio de Janeiro where Captain Phillip sourced his cactus and if this is the case the cochineal on it would have been *Dactylopius ceylonicus,* not the usual scale insect used for red cochineal dye.

The next section, health and safety issues, cover the problem with large spines and small spines (*glochids*). Collection and preparation of voucher herbarium specimens of opuntioid cacti is the next section which is informative and hopefully will result in the collection of more specimens. To date it appears that those working with cacti are willing to collect specimens but would rather send them to someone else to process. I also think that recording petal-like tepal colour is not as useful as digital photos – colour is very subjective. As one who has collected and processed many cactus specimens I can understand the reluctance of most collectors when it comes to collecting opuntioid cacti – I have to have jewelers forceps with me to remove glochids whenever I process opuntioid specimens.



The morphological features section is essential for anyone wanting to understand terminology used in cactus descriptions.

Dispersal is the subject of the next section. Most *Opuntia* species spread by movement of seed but for cacti covered in this booklet spread is mainly by segment movement. Movement to new areas distant from current areas is mainly via humans wishing to plant them. Much of more local movement of cylindrical stemmed cacti is down waterways or outwards with flood waters.

The last section of the introduction covers control. Personally I think that there is too much emphasis on chemical control in this section. Chemical control is too expensive to conduct over large areas. Biological control is the only method that is suitable for large scale control. In my past life working on cactus control, there were examples of where over seven times the value of the land was spent on *Opuntia aurantiaca* control and, after all control efforts, there was said to be as much cactus present as before any control was carried out. Cochineal control, using *Dactylopius austrinus* in this case, could actually keep the cactus at lower levels than the peaks reached after chemical control had ceased. That being said, the forms of *Dactylopius tomentosus* present in Australia that are used to control *Cylindropuntia* species are only suitable for control of *C. imbricata* (the species it was brought in to control), *C. leptocaulis* and to a lesser extent *C. tunicata*. More forms (probably different species if the taxonomy was sorted out properly) are being brought in for control of *C. fulgida* and *C. pallida*. Other cylindrical stemmed species are considered to be minor problems by comparison so are not currently targets for biological control.

The field identification part has excellent images that should enable identification of species. The key, as for most keys, works best if you know the species and the exceptions to parts of the key. Species such as *Opuntia aurantiaca* often have cylindrical stems so

it is difficult to key it to an *Opuntia*. Some of the *Cylindropuntia* species such as *C. leptocaulis* and *C. tunicata* are often <0.4 m high so the suggestion that *Cylindropuntia* species are >0.4 m high could have been modified – but the rest of the couplet should have enabled *Corynopuntia* to be separated from *Cylindropuntia*. However, most will use the images for identification and these are excellent. In some cases there will be problems unless flowers are present and in some cases plants may take a few years to flower. This is particularly a problem with separating *Cy. pallida* and *Cy. tunicata*. This is probably why these species have the same common name, Hudson pear, in the Lightning Ridge area.

The taxonomy section has excellent line drawings and good descriptions. This could have been combined with the previous section but, as most will use the colour images, I think that the separation is justified. Bob obviously went to the Lightning Ridge area after years of chemical control as he gives *Cy. pallida* height as up to 1 m high rarely to 2 m whereas before control when I visited the area many plants were up to 1.2 m high.

It would have been good to have distribution maps for each of the species but due to poor coverage of cactus specimens in herbaria they would not be of much use. Hopefully this booklet will encourage the collections required to make distribution maps informative.

On the whole this is a very useful publication for those wanting to identify species covered in this booklet.

The planned second booklet will cover the genus *Opuntia*, distinguished by its flat stems and including *Opalea*, often recognised as a separate genus.

New books

Non-native plants of western and central Cape York Peninsula, Far North Qld: A field guide to common weeds. ***By Nicholas Smith***
Nelumbo Botaniks (free download) www.nelumbo.com.au/publications.html. 125 pp.

Another in the "pocket-size" series by Nick Smith with its single species per page. Species are arranged alphabetically and each one has colour photographs depicting appropriate features together with a brief account of the plant. This one is downloadable for free and it is the author's intention to release it as an 'app' for iphone/ipad after field trialling in March next year. If you haven't seen any of these pocket guides now is your chance – and the guide is not limited to the designated area since many of the weeds covered are problems in the tropical savannah from Broome to Townsville.

Banksia lady: Celia Rosser, botanical artist. ***By Carolyn Landon.***
Clayton: Monash University Publishing, 2015. Octavo, paperback, 241 pp., colour photographs, illustrations. AU$40.00

The story of internationally acclaimed botanical illustrator, Celia Rosser, who dedicated her life to painting the entire genus of *Banksia*. Her dedication to this task put her at the centre of the Monash Banksia Project underwritten by the University for twenty-five years and culminating in the production of the three-volume florilegium, one of the great publishing events of the twentieth century. In telling the story of Celia Rosser's unparalleled talent and extraordinary achievement, this book explores the history of botanical illustration, botany, academia, gardens and their herbaria and Australia's place in changing the shape of the world. [Adapted from publisher's blurb].

Explorers routes revisited. Giles 1875 expedition. ***By Lesley Brooker***
Hesperian Press, W.A., 2015. ISBN 978-0-85905-612-0, A4, illustrated in colour, indexed, 200 pages, 840 gm. AU$40.00 (no discount) + postage.
Available only directly from the author at LesMikeBrooker@bigpond.com

Another in the series of *Explorers routes revisited*, two of which (Moore and

Drummond's expeditions) were reviewed in *ASBS Newsletter* 161. This one deals with Ernest Giles' major 4th Expedition of 1875 from Beltana to Perth, with plenty of background about the participants and their journey together with historical and contemporary maps and numerous colour photographs of the places visited and of the plants collected. A must for anyone dealing with the collections of the expedition, but also for general interest and a modest price for such a large piece of historical research.

Among wild animals and people in Australia. ***By Eric Mjoberg***
A translation of Mjoberg's (1915) Bland vilda djur och folk i Australien by Margareta Luotsinen and Kim Akerman
Hesperian Press, W.A., 2012. 362pp, ISBN 978-0-85905-507-9. RRP $95

Better known for his collecting of aboriginal skulls and skeletons, the Swede Eric Mjoberg was the Amelie Dietrich of the Kimberley's. A translation of Mjoberg's diaries with reference to his animal and plant collections was produced by Hesperian Press in 2012 and reviewed at the time (Web ref. 1) but it was a recent review of the same work, and of its author, that brought the book to my attention (Web ref. 2). The first review makes clear reference to a list of the plants collected by Mjoberg, compiled by Tim Willing and Alex George.

Mjoberg did not confine his collections to the Kimberley region, also collecting in north Queensland (Ferrier 2006). There are two species named for him, *Sorghum mjoebergii* from the Kimberleys and *Leptospermum mjoebergii* from North Queensland, both of them described by the New South Wales botanist Edwin Cheel (1872-1951).

References

Ferrier, A. (2006). Dr Eric Mjoberg's 1913 scientific exploration of North Queensland's rainforest region. Memoirs of the Queensland Museum, Cultural Heritage series 4: 1-27.

Web ref. 1: *www.kimberleysociety.org/images/kimbsoc---inooyuxeey.pdf*

Web ref. 2: *www.theaustralian.com.au/arts/review/beautiful-and-broken-forever-in-the-eyes-of-eric-mjoberg/story-fn9n8gph-1226582888695*

Plant life of southwestern Australia. Adaptations for survival. ***By Philip K. Groom and Byron Lamont***
***De Gruyter Open at* www.degruyter.com/view/product/430900**
ISBN: 978-3-11-037019-5 (open access eBook); ISBN 978-3-11-037016-4 (hardcover). 268 pp.

Philip Groom and Byron Lamont of Curtin University offer insights into Australia's southwest flora, which, apart from the toughest and most spiny vegetation, boasts the greatest number of species that store their seeds in woody fruits. This is an up-to-date insight into the evolution and diversity of that flora, and details adaptations that resulted in response to nutrient-impoverished soils, recurrent fires and summer droughts. It also discusses strategies designed to maintain or ensure species survival that relate to pollination, plant leaves and seeds. They provide a thorough overview of the plant adaptations of the unique native plants of the south-western corner of Australia. [Adapted from publisher's blurb]

Botanical treasures: objects from the herbarium and library of the Royal Botanic Garden Edinburgh. ***Multiple curatorial and library authors***
Royal Botanic Gardens, Edinburgh, August 2014. Octavo, paperback, oblong format, 160 pp. colour photographs, illustrations.
ISBN: 9781906129972. $AU40

A special publication marking 50 years since the opening of the present RBGE building by the Queen in 1964. This wonderfully illustrated book draws stories from the plant collections and the contents of the library – stories arising from plants collected by Charles Darwin, David Douglas and William Roxburgh amongst many others, stories of some of the older herbals, of artworks, maps, notebooks and objects held within the archive and even the story which can be told from a collection of 15th century hazel sticks. Even if they don't have quite the 300 year history of the Edinburgh garden every herbarium and library should be able to emulate this publication, advertising their own treasures.

Chapter conveners

Adelaide
Robyn Barker
State Herbarium of South Australia
Department for Environment, Water & Natural Resources
PO Box 2732, Kent Town, SA 5071
Tel: (+61)/(0)8 8222 9348
Email: robyn.barker@sa.gov.au

Armidale
Jeremy Bruhl
Department of Botany
Univ. of New England, Armidale, NSW 2351
Tel: (+61)/(0)2 6773 2429
Email: jbruhl@une.edu.au

Brisbane
Hernan Retamales
Earth, Environmental and Biological Sciences
Science and Engineering Faculty
Queensland University of Technology
GPO Box 2434, Brisbane Qld 4001
(+61)/(0)452 510 421
Email: hernanalfonso.retamales@student.qut.edu.au

Cairns
Katharina Schulte
Australian Tropical Herbarium (CNS)
James Cook University Cairns Campus
PO Box 6811, Cairns Qld 4870
Tel: (+61)/(0)7 4232 1686
Email: katharina.schulte@jcu.edu.au

Canberra
Alexander Schmidt-Lebuhn
Centre of Australian National Biodiversity Research
CSIRO Plant Industry
Canberra, ACT 2601
Tel. (+61)/(0)2 6246 5498
Email: Alexander.S-L@csiro.au

Christchurch
Ilse Breitwieser
Allan Herbarium, Landcare Research New Zealand Ltd
PO Box 69040. Lincoln 7640. New Zealand
Tel: (+64)/(03) 321 9621; Fax: (+64)/(03) 321 9998
Email: breitwieseri@landcareresearch.co.nz

Darwin
Ian Cowie
Northern Territory Herbarium
PO Box 496, Palmerston, NT 0831
Tel.: (+61)/(0) 8999 4511
Email: ian.cowie@nt.gov.au

Hobart
Matt Baker
Tasmanian Herbarium,
Tasmanian Museum and Art Gallery
PO Box 5058, UTAS LPO, Sandy Bay, Tas. 7005
Tel: (+61)/(0)3 6226 1029
Email: matthew.baker@tmag.tas.gov.au

Melbourne
Frank Udovicic
National Herbarium of Victoria
Private Bag 2000, South Yarra, Vic. 3141
Tel: (+61)/(0)3 9252 2313
Email: frank.udovicic@rbg.vic.gov.au

Perth
Juliet Wege
Western Australian Herbarium
Department of Environment & Conservation
Locked Bag 104, Bentley Delivery Centre, WA 6983
Ph: (+61)/(0)8 9219 9145
Email: Juliet.Wege@dpaw.wa.gov.au

Sydney
Peter Weston
National Herbarium of NSW
Mrs Macquaries Road, Sydney, NSW 2000
Tel: (+61)/(0)2 9231 8111
Email: peter.weston@rbgsyd.nsw.gov.au

Contacting major Australasian herbaria and systematics institutions

International calls. Australia +61, New Zealand +64, then drop leading zero from bracketed area code

AD tel: (08) 8222 9307 fax: (08) 8222 9353 *www.environment.sa.gov.au/Science/Science_research/State_Herbarium*	HO tel: (03) 6226 2635 fax: (03) 6226 7865 *www.tmag.tas.gov.au/collections_and_research/tasmanian_herbarium*	MEL tel: (03) 9252 2300 fax: (03) 9252 2350 *www.rbg.vic.gov.au/science/herbarium-and-resources*	NSW tel: (02) 9231 8111 fax: (02) 9251 7231 *www.rbgsyd.nsw.gov.au/science/Herbarium_and_resources*
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ASBS publications

Australasian Systematic Botany Society Newsletter
Back issues

Back issues of the Newsletter are available from Number 27 (May 1981) onwards, excluding Numbers 29, 31, 60, 84–86, 89–91, 99, 100, 103, 137–139, and 144. Here is the chance to complete your set.

Australian Systematic Botany Society Newsletter No. 53
Systematic Status of Large Flowering Plant Genera
Edited by Helen Hewson, 1987

This Newsletter issue includes the reports from the February 1986 Boden Conference on the "Systematic Status of Large Flowering Plant Genera". The reports cover: the genus concept; the role of cladistics in generic delimitation; geographic range and the genus concepts; the value of chemical characters, pollination syndromes, and breeding systems as generic determinants; and generic concepts in the Asteraceae, Chenopodiaceae, Epacridaceae, *Cassia*, *Acacia* and *Eucalyptus*.

Cost: Free for all newsletters except Number 53 (postage may be charged)
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Evolution of the Flora and Fauna of Arid Australia (book)
Edited by W.R. Barker & P.J.M. Greenslade.
Peacock Publications, ASBS & ANZAAS, 1982

This collection of more than 40 papers will interest all people concerned with Australia's dry inland, or the evolutionary history of its flora and fauna. It is of value to those studying both arid lands and evolution in general. Six sections cover: ecological and historical background; ecological and reproductive adaptations in plants; vertebrate animals; invertebrate animals; individual plant groups; and concluding remarks.

Cost: $20, plus $10 postage (in Australia).
This book is almost out of print. There are a few remaining copies.

To order a copy of this book email Bill Barker at: bill.barker@sa.gov.au

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History of Systematic Botany in Australasia (book)
Edited by P.S. Short. A4, case bound, 326 pp. ASBS, 1990

For all those people interested in the 1988 ASBS symposium in Melbourne, here are the proceedings. It is a well presented volume, containing 36 papers on: the botanical exploration of our region; the role of horticulturalists, collectors and artists in the early documentation of the flora; the renowned (Mueller, Cunningham), and those whose contribution is sometimes overlooked (Buchanan, Wilhelmi).

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AUSTRALASIAN SYSTEMATIC BOTANY SOCIETY INCORPORATED

The Society

The Australasian Systematic Botany Society is an incorporated association of over 300 people with professional or amateur interest in botany. The aim of the Society is to promote the study of plant systematics.

Membership

Membership is open to all those interested in plant systematics. Membership entitles the member to attend general meetings and chapter meetings, and to receive the Newsletter. Any person may apply for membership by filling in a "Membership Application" form, available on the Society website, and forwarding it, with the appropriate subscription, to the Treasurer. Subscriptions become due on 1 January each year.

The ASBS annual membership subscription is AU$45; full-time students $25. Payment may be by credit card or by cheques made out to Australasian Systematic Botany Society Inc., and remitted to the Assistant Treasurer. All changes of address should be sent directly to the Assistant Treasurer as well.

The Newsletter

The Newsletter is sent quarterly to members and appears simultaneously on the ASBS Website. It keeps members informed of Society events and news, and provides a vehicle for debate and discussion. In addition, original articles, notes and letters (not exceeding ten published pages in length) will be considered. Citation: abbreviate as *Australas. Syst. Bot. Soc. Newslett.*

Contributions

Send copy to the Editor preferably by email attachement submitted as: (1) an MS-DOS file in the form of a text file (.txt extension), (2) an MS-Word.doc file, (3) a Rich-text-format or .rtf file in an email message or attachment or on an MS-DOS disk or CD-ROM. Non-preferred media such as handwritten or typescripts by letter or fax are acceptable, but may cause delay in publication in view of the extra workload involved.

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The deadline for contributions is the last day of February, May, August and November. All items incorporated in the Newsletter will be duly acknowledged. Authors alone are responsible for the views expressed, and statements made by the authors do not necessarily represent the views of the Australasian Systematic Botany Society Inc.

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A 20% discount applies for second and subsequent entries of the same advertisement. Advertisements from ASBS members are usually exempt from fees but not the insertion costs in the case of a flyer. Contact the Newsletter Editors for further information.

Editors

Bill Barker State Herbarium of South Australia PO Box 2732 Kent Town SA 5079 Tel. (+61)/(0) 427 427 538 Email: *bill.barker@sa.gov.au*	**Book Reviews editor**: John Clarkson Queensland Parks & Wildlife PO Box 156 Mareeba, Qld 4880 Tel: (+61)/(0) 7 4048 4745 Email: *John.Clarkson@qld.gov.au*	Robyn Barker State Herbarium of South Australia PO Box 2732 Kent Town SA 5079 Tel. (+61)/(0) 8 8222 9348 Email: *robyn.barker@sa.gov.au*

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